Subsistence Salmon Fishing by Residents of Nome, Alaska, 2001

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Abstract

Nome was among the first western Alaska communities to be affected by the recent declines in western Alaska salmon stocks. In response to severe salmon fishing restrictions in the Nome subdistrict, some Nome families began subsistence fishing in adacjent less regulated areas. Except in Pilgrim River, the efforts and harvests of these fishing families have not been documented, either through permits or surveys. Nome residents' impact on the fish stocks and on the fishing opportunities for residents of these adjacent areas has been unknown.

This project identified three different strata of Nome households believed to be fishing for salmon outside the Nome permit areas: (1) members of the King Island Community, (2) other Nome households identified by a network of key respondents in Nome, and (3) Nome households whose members had obtained sport fishing licenses in 2000. Households in each group were surveyed to estimate the number of salmon harvested in 2001, the locations of harvests, and other data. In addition, key respondents in Teller and White Mountain were interviewed to discuss the impacts of Nome residents' fishing on adjacent communities.

An analysis of Nome survey and permit data for 2001 indicated that Nome residents harvested 47 percent of their salmon outside the Nome permit area. Of the estimated 6,138 salmon harvested by sampled households, 1,158 salmon (19 percent) came from the Port Clarence area, and 1,426 salmon (23 percent) came from the White Mountain-Golovin area. Nome residents relied primarily on nets to harvest salmon in the Port Clarence area, where 94 percent of Nome's harvest was taken with nets and only 6 percent taken with rod and reel. Rods and reels were more commonly used in the White Mountain-Golovin Area, where 61 percent of the harvest was taken with nets and 39 percent with rod and reel.

Respondents interviewed in White Mountain and Teller reported increased competition for fishing sites related to increased effort by Nome residents. In Teller, the sites in contention were set net sites along the beach in front of the community. In White Mountain, the sites in contention were seining sites along the Fish and Niukluk rivers. In Teller, respondents reported that Nome residents typically fished 300-foot nets, compared to 100- to 150-foot fished by Teller respondents, and a few Teller residents changed their location or increased their gear length in order to compete with Nome residents. Respondents in both Teller and White Mountain were concerned that increased effort and harvest in their areas by Nome residents eventually would lead to increased regulation of subsistence fishing.

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Acknowledgments

The authors would like to thank the scores of Nome residents who agreed to respond to the survey. For many of you, salmon fishing has been a very frustrating experience during the past decade. We appreciate your cooperation and patience. We also appreciate the support of the King Island Native Community, the Teller Traditional Council, and the White Mountain IRA Council, who provided permission to conduct this research. To those individuals in Teller and White Mountain, we appreciate your participation in the town hall meeting and interviews, and your willingness to share your observations and knowledge.

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1
Introduction

During the past decade, increasingly severe restrictions have been placed on subsistence salmon fishing in the Nome subdistrict. In response, some Nome families appeared to change their subsistence salmon fishing patterns. Prevented from fishing for salmon near Nome, they began subsistence fishing for salmon in adacent waters in the Norton Sound and Port Clarence districts. Except for the Pilgrim River and Salmon Lake, the efforts and harvests of these fishing families have not been documented, either through permits or surveys. Nome residents' impact on the fishing opportunities of residents in these adjacent areas has been unknown.

This project identified Nome households that were believed to be fishing for salmon outside the Nome permit areas. Three different groups of households were contacted. The first group included members of the King Island Community, a sub-community of Nome whose members usually fished near the mouth of Feather River, west of the Nome permit area. The second group included other Nome households identified by a network of key respondents in Nome, who believed these other households were fishing outside the salmon permit area. The third group included Nome households whose members had obtained sport fishing licenses in 2000, and who may have been using salmon caught with rods and reels for subsistence. Households in each group were surveyed to estimate the number of salmon harvested in 2001, the locations of harvests, and other information related to salmon fishing histories and practices.

In addition, this project interviewed key respondents in Teller and White Mountain to discuss the impacts of Nome residents' fishing on adjacent communities. Estimates of salmon harvest for Teller and White Mountain were obtained through a separate Department of Fish and Game project (Georgette et al 2002).

Background

Of all the communities in western Alaska, Nome was among the first to be affected by declines in western Alaska salmon stocks, and the impacts have been among the most severe. Salmon harvests, fishing periods, and open waters have been sharply reduced during the past 25 years, but especially since 1990. In 1999, a Tier II subsistence fishery was initiated for chum salmon in the Nome subdistrict, the first Tier II fishery in Alaska. In 1999, only 20 Tier II chum permits were issued, and 337 chum were reported caught. In 2000, only 10 Tier II chum permits were issued, and 535 chum were reported. Those were the first times since permits were required in 1975 that chum catches in the Nome subdistrict fell below 1,500 annually. From 1975 through 1991, Nome residents' annual chum catch in most years ranged between 3,000 and 8,000 chum (Magdanz 1992).

One response of Nome fishing families to severe salmon fishing restrictions has been to expand their fishing areas. A second response has been to increase their use of rods and reels. Regulations making rods and reels legal subsistence gear have been adopted in some areas of western Alaska, including northern Norton Sound.

Unlike most rural Western Alaska communities, Nome had well-maintained gravel roads that allowed residents easy access to streams within a 75-mile radius. It was only a two-hour drive to reach streams in the Port Clarence District or streams in Subdistrict 2 of the Norton Sound District. Especially since the implementation of Tier II restrictions, increasing

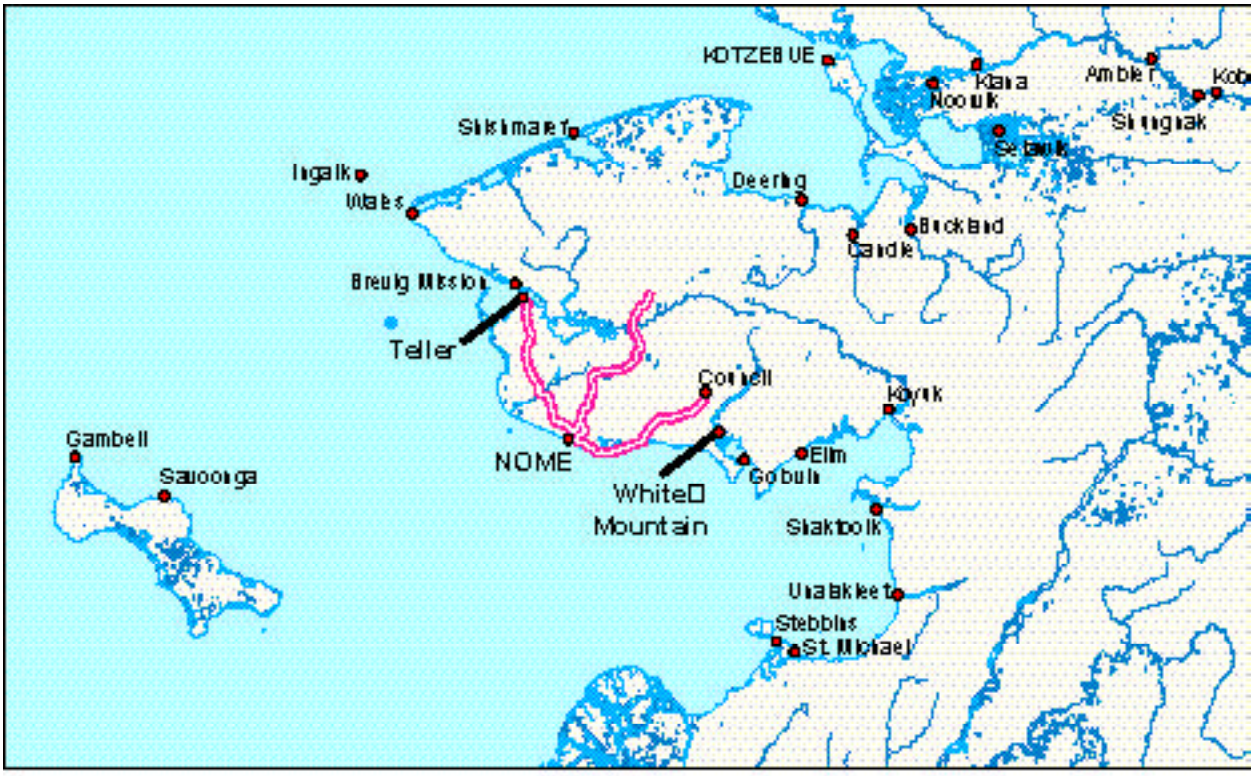

Figure 1-1. The Study Area. In this study, researchers contacted households in Nome, Teller and White Mountain (shown in bold above). Three state-maintained roads allow Nome residents to use cars and trucks to access the southern Seward Peninsula. Nome is the only northwest Alaska community with such an extensive road system.

numbers of Nome families were expanding their fishing areas to include streams in these adjacent areas. However, most of these streams were already being used by residents of Teller, Brevig Mission, Council, White Mountain, and Golovin. The river systems most affected by the expanding harvest of Nome fishing families included the Kuzitrin, Fish, Niukluk, and Unalakleet rivers. Portions of these rivers were under federal jurisdiction. Virtually all the users of these streams were federally eligible rural residents, including Nome residents.

Salmon harvests in the Norton Sound–Port Clarence Area were monitored through two different systems: permits and surveys (Magdanz 1994). Residents of Nome who fished in the Nome Subdistrict and portions of the Port Clarence District reported their harvest on subsistence salmon permits. Residents of other Norton Sound-Port Clarence Area communities reported their harvests through surveys conducted in each community after the fishing season ended each fall. However, residents of Nome who fished outside the permit area fell between the two systems. They were not contacted as part of the survey projects in the smaller communities, nor were they covered by the permit system.

This project addressed this problem by identifying and surveying Nome residents whose harvests have not been documented by either the permit or survey system. It included rod and reel harvests, because subsistence users who used primarily nets in the past increasingly relied upon both nets and rods and reels, especially for coho salmon, and because rods and reels were legal subsistence gear under federal regulation.

Purposes and Objectives

The purpose of this project was to document the harvest patterns of those Nome families who fished outside the Nome permit area or who fished with rods and reels in the Nome area. The objective was to publish a summary of the reports for use by organizations and the public in better managing Norton Sound's salmon fisheries.

Figure 1-2. Changing patterns of subsistence harvesting. During periods when rivers in the Nome Subdistrict were closed to subsistence net fishing, some families turned to rods and reels to fill their fish racks. This elder woman is fishing for pink salmon on the Nome River. Rods and reels were legal subsistence gear in this area beginning in 2000.

Findings may help both state and federal managers determine what action might be necessary to protect salmon stocks, ensure continued subsistence fishing opportunities, and adequately monitor salmon harvests in the Norton Sound-Port Clarence Area.

Research Questions and Hypotheses

The study attempted to answer several research questions:

- How many salmon of each species were being harvested?
- Where were these salmon harvested?
- What types of gear were used for harvesting?
- What types of transportation were used to access harvest areas outside of Nome?
- Which areas were used for subsistence salmon fishing during the past 10 years?
- How has the use of salmon changed during the past 10 years?

Researchers expected that Nome residents' patterns of salmon harvests had changed during the 1990s. Hypotheses included:

- The use of areas outside the Nome permit area had increased.
- The use of salmon by Nome residents has changed, with a decline in use of local salmon stocks, an increase in the use of other wild foods including more distant salmon stocks, and an increase in the use of commercial ("store-bought") foods.
- Some families were discouraged from salmon fishing by the Tier II permit system.

Literature Review and Rationale

The Division of Subsistence of the Alaska Department of Fish and Game has published seven papers and reports addressing salmon fishing by residents of Nome. These include:

Nome Salmon Subsistence Research Report (Thomas 1980a), *Issue Paper on the Nome River Subsistence Salmon Fishery* (Thomas 1980b), *Nome River Fishery II* (Magdanz 1981), *Resource Use and Socioeconomic Systems: Case Studies of Fishing and Hunting in Alaska Communities* (Wolfe and Ellanna 1983), *Controls on Fishing Behavior on the Nome River* (Magdanz and Olanna 1984), *Subsistence Land Use in Nome, a Northwest Alaska Regional Center* (Magdanz and Olanna 1986), and *Subsistence Salmon Fishing by Permit in the Nome Subdistrict and Portions of the Port Clarence District, 1975-91* (Magdanz 1992).

Summaries of all subsistence and commercial fisheries in the Norton Sound—Port Clarence Area appeared in the *Annual Management Reports* published annually by the ADF&G's Division of Commercial Fisheries.

The Norton Sound rod and reel harvest has been estimated previously through statewide mail out surveys. However, the number of Norton Sound respondents has been so small that standard errors are often greater than the estimates themselves (e.g. Howe et al 1999:104-105).

This report synthesizes pertinent information from these previous investigations. However, most of the salmon harvests by the households identified in this project were not documented by these other projects and reports. These households fished in areas where subsistence permits were not required, and lived in an area (the community of Nome) that was not surveyed in the annual salmon subsistence surveys.

Presentation

Chapter 2 of this report summarizes the methods used in the survey and analyses. Chapter 3 describes the setting. Chapters 4 and 5 present the findings, first organized by fishing area and second organized by each sampled group of households. Chapter 6 discusses the findings, and Appendix 1 includes the survey instrument used in this study.

2
Methods

The Alaska Department of Fish and Game began documenting salmon harvests in the Nome subdistrict in 1974 through a subsistence salmon permit system administered by ADF&G. Kawerak and the Alaska Department of Fish and Game began documenting subsistence salmon harvests in approximately 16 smaller northwest Alaska communities in 1994 through a salmon harvest survey (Georgette et al 2002). Informal surveys of salmon harvests in the smaller communities also were conducted by ADF&G from 1961 through 1984, but these were believed to be substantially incomplete.

This was Kawerak and ADF&G's first subsistence salmon harvest survey effort in Nome. The survey procedures and instruments used were similar to those used by Kawerak and ADF&G in the smaller communities, and relied upon respondents' restrospective recall of salmon harvests by household members. The project combined data from the permit system and surveys to provide the first comprehensive estimate of Nome households' subsistence harvests, regardless of the area fished.

At the time of the 2000 census, Nome included 1,184 occupied households. Of these, researchers identified 663 households (56 percent) in three different strata: (1) households allied with the King Island community, (2) households whose members obtained sport fishing licenses in 2000, and (3) other Nome households whose members fished outside the area in which subsistence salmon permits were required. Households whose members did not fish, or whose members fished under the existing subsistence salmon fishing permit program were not targeted for surveys. Of the 663 identified fishing households in these strata, 158 were surveyed after the 2001 salmon harvesting season.

In addition, 130 households of Nome's 1,184 households (11 percent) obtained subsistence salmon permits to fish in the Nome permit area in 2001. Thirty five of these permit households also were surveyed, so altogether salmon harvest information was obtained from 253 (21 percent) of Nome's 1,184 households in 2001.

In addition to the survey and permit data, researchers conducted key respondent interviews in Teller and White Mountain. Respondents were asked about their personal fishing histories and practices, and about the effects of Nome residents' fishing in the vicinity of Teller and White Mountain.

Surveys were administered in October, November, and December 2001. Data entry and analysis were conducted in May, June, and July, 2002. Interviews were conducted in August and October. A draft report was circulated for comments in December 2002.

Principal Investigators

Four different principal investigators were involved in this study. The investigation plan was proposed by Don Stiles and Austin Ahmasuk for the Natural Resources Department of Kawerak, Inc. Stiles left Kawerak before the project began, and Ahmasuk assumed his role. Ahmasuk resigned from Kawerak in May 2002, and Kawerak's duties on this project were assumed by Sandra Tahbone. During proposal development, Kawerak invited the Alaska Department of Fish and Game's Division of Subsistence to participate in the project. For the Division of Subsistence, James Magdanz was the principal investigator. He was assisted by Gretchen Jennings, who headed the Division's data management team, and by Kurt Kamletz and Jessie Mallery.

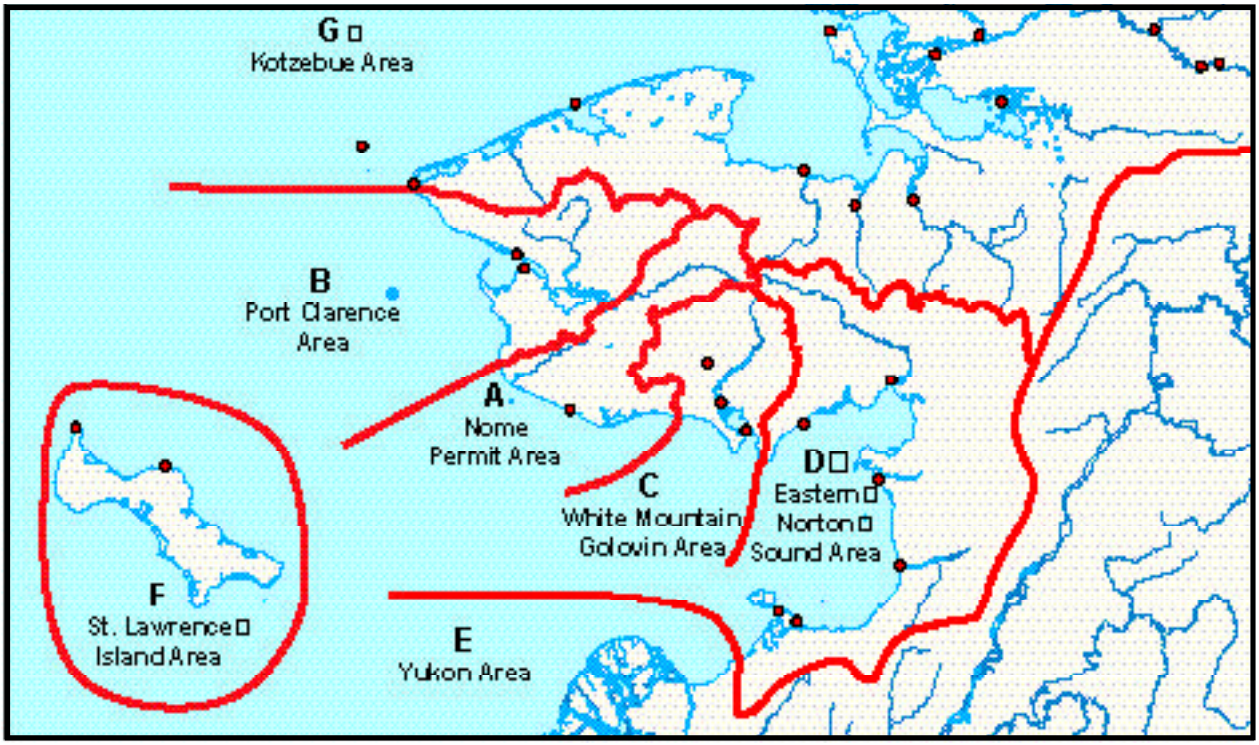

Figure 2-1. Fishing areas used in survey instrument. Map shows the seven fishing areas listed on the survey instrument. A copy of this map was available to surveyors and respondents to help identify fishing locations.

Tahbone and Magdanz developed the survey instrument, and reviewed the completed surveys. Tahbone directed survey administration, conducted follow-up interviews, and reviewed the analyses and the written reports. Mallery and Kamletz were responsible for data entry and data analysis. Tahbone, Magdanz, and Ahmasuk conducted the key respondent interviews. Magdanz also conducted some data analysis, and wrote the draft and final reports with Tahbone's assistance.

Instrument

Harvest data were collected with a two-part, eight-page salmon harvest survey (Appendix 1). The survey included four pages of general questions about household's fishing histories. The survey also included four pages of harvest questions similar to those on the instrument used by Kawerak and ADF&G to monitor salmon harvests in northwest Alaska. Harvest data were gathered for all gear types, including rod and reel.

Because the sampled Nome households fished for salmon in a number of different areas, the instrument asked about salmon fishing in each of seven specific northwest Alaska areas, including the Nome permit area. Space also was provided for respondents to name other areas they may have fished that were not anticipated by the researchers. Researchers developed a map of these areas to aid in survey administration (Figure 2-1). Households that fished in more than one area were asked to fill out a separate harvest survey page for each area fished.

Survey Samples

One project goal was to identify households who fished outside the Nome permit areas, and survey samples of these households. Therefore, the sample was not designed to include or to represent all Nome households. Rather, the samples were intended to facilitate estimates of harvests that occurred outside the permit system. The survey population included Nome fishing households in three different strata:

TABLE 2-1. SURVEY SAMPLING GOALS AND RESULTS

	SAMPLE 1 Households Affiliated with King Island Community	SAMPLE 2 Households Fishing Outside Nome Salmon Permit Areas	SAMPLE 3 Households With a 2001 Sport Fishing License	ALL SAMPLES All Selected Households
Number of Households by Stratum				
Investigation Plan Estimate	100	50	1,000	1,150
Initial Household Lists	38	24	642	704
Duplicate Households	1	0	11	12
HHs in Samples 1 or 2	0	0	29	29
Final N of Households	37	24	602	663
Sampling Goals				
Type of Sample	Census	Census	Random	--
Number of HHs in Sample	37	24	100	161
Desired Sample Percentage	100 %	100 %	17 %	24 %
Sampling Results				
Attempted	37 (100%)	24 (100%)	602 (100%)	663 (100%)
No Contact	4 (11%)	3 (13%)	359 (60%)	366 (55%)
Moved Away	1 (3%)	0 (0%)	57 (9%)	58 (9%)
Deceased	0 (0%)	0 (0%)	3 (0%)	3 (0%)
Refused	9 (24%)	3 (13%)	66 (11%)	78 (12%)
Interviewed	23 (62%)	18 (75%)	117 (19%)	158 (24%)

- 37 member households of the King Island Native community who fished for salmon outside the areas in which subsistence permits are required. The King Island Native community resided entirely within the community of Nome, but fished in its traditional territory about 75 miles to the west.
- 24 other Nome households, whose members fished for salmon outside the areas in which subsistence salmon permits were required. These households fished in the Port Clarence District, and in several subdistricts of the Norton Sound District, particularly subdistrict 2 (the Fish River drainage).
- 117 of the approximately 602 Nome households whose members obtained sport fishing licenses in 2000.

Sampling methods varied among the three samples. For the King Island sample, investigators first obtained informed consent from the King Island Native Community to conduct the research, and then obtained a list of member households. Investigators attempted to contact each household and administer a survey. A total of 23 households (62 percent of the King Island sample) was surveyed.

For the other Nome households, investigators used a network approach to identify the sample. In this approach, investigators began by contacting all Nome households known to fish outside the Nome permit area. Each household was asked if they knew any other households that fished outside the permit area. These additional households were contacted, and asked the same questions. The identification process continued until no additional households were identified, and at that point the sample was

considered complete. Key respondents identified 24 households in this sample.

For the sport fish license holders, investigators obtained a list of 898 individuals who reported a Nome address on their 2000 sport fishing license (a "sport" license was required for anyone who used a rod and reel, regardless of the purpose of the fishing). This list was reviewed for redundancy (some households had two or more members with licenses, and some households were included in one of the other two samples). The final list included 602 households, and 117 of these households were surveyed.

In addition to the survey data, researchers also obtained salmon harvest data for 130 households that obtained subsistence salmon permits from the Alaska Department of Fish and Game in Nome. Of these 130 households, 35 were also contacted by survey. The remaining 95 households were not part of the survey sample. The permits did not include questions about fishing histories or alternative sources of salmon, such as were included on the survey. The permit data were used only to calculate total reported and estimated harvests by area.

To collect information on the effects of Nome fishing in adjacent areas, Tahbone and Magdanz traveled to Teller on August 12, 2002. Tahbone and Ahmasuk traveled to White Mountain on October 26-27, 2002. In Teller, researchers conducted interviews with heads of five households, ranging in age from approximately 50 through 80 years. All but one had lived in Teller most of their lives; the shortest-tenured respondent had lived in Teller about 10 years. All but one were active fishermen; the exception was a community leader whose family fished. In White Mountain, researchers convened a town meeting attended by 11 people, and after the meeting researchers interviewed 3 key respondents.

Officers of the Teller IRA suggested families to interview. Researchers also relied on their personal knowledge to select families to interview. The town meeting in White Mountain was open to the public.

Procedures

Kawerak was primarily responsible for administering the survey, while the Division of Subsistence was primarily responsible for data analysis and write-up. Principal investigators from each organization, however, assisted one another in many aspects of the project.

At the beginning of the survey effort, Kawerak's principal investigator reviewed the instrument and explained the sampling procedures with the survey crew, Eric Trigg, Barbara Aukon, and Gabriel Muktoyuk. Surveys were administered to all three samples simultaneously. King Island surveys began on 5 November 2001 and were completed on 11 November. Other Nome household surveys began on 5 November 2001 and were completed on 14 November. Nome fishing license household surveys began 6 November 2001 and were completed on 26 November.

Surveyors attempted to contact each household three times. If three contact attempts on three separate occasions were unsuccessful, the household was listed as "no contact" and no further attempts were made. In the sport fishing license sample, a "no contact" household was replaced by the next household in a random draw.

Surveyors found it difficult to locate households in the sport fishing license sample. Nome does not have home mail delivery. The only address information available on the license list was a post office box number. Licensees were not required to provide a phone number to ADF&G, so phone numbers did not appear on the license list. Consequently, surveyors had to locate the survey respondents using licensee names, which proved difficult in a community of 3,000 people. Licensees whose residence or work location was known to the survey crew were contacted by phone or in person. Licensees with listed phone numbers were contacted by telephone. If members of the survey crew were not able to determine where a licensee lived or worked, and were not able to locate a telephone number, then that licensee was marked as "unknown" and was not contacted.

Completed surveys were reviewed by principal investigators for Kawerak, and again

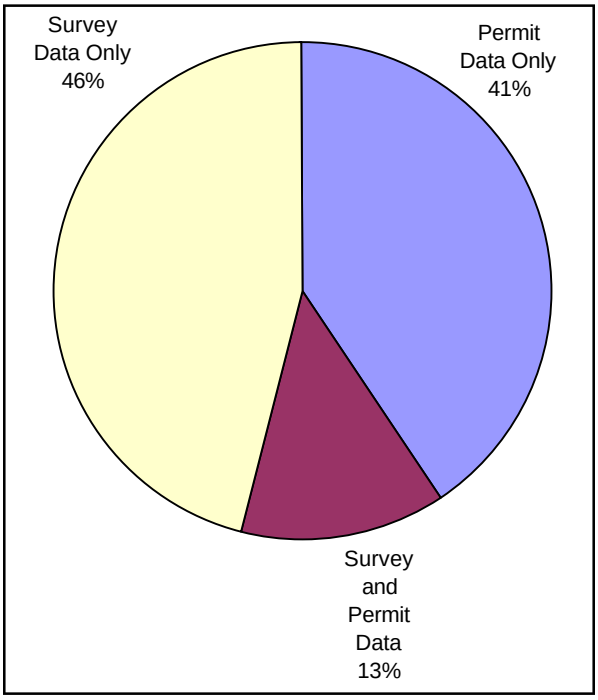

Figure 4-2. Harvest data sources. A total of 266 Nome households reported harvesting salmon for subsistence in 2001, through two reporting systems.Thirty five households (13 percent) filed both surveys and reports.

by principal investigators for the Division of Subsistence. After review, the surveys were mailed to Anchorage for data entry.

Key respondent interviews in Teller and White Mountain lasted approximately one hour. They were guided by an informal protocol of questions. Researchers asked similar questions of all respondents, but not always in the same sequence. Respondents were asked to summarize their own fishing history and practices, to describe the fishing activities of non-local residents, to discuss the impacts of non-local fishing on local fishing, and to suggest ways of minimizing conflicts between local and non-local fishing activities. In Teller, researchers took notes on a laptop computer during the interview. In White Mountain, researchers recorded the meeting and the interviews on a tape recorder and later transcribed the tapes.

Limitations and Assumptions

This project collected information on salmon fishing that had occurred at least two months and as long as five months before interviews were conducted. Researchers assumed that respondents could remember their important activities during the past year. To minimize recall problems, surveys were conducted with household heads, on the assumption that household heads were most likely to be aware of all household members' activities. Respondent recall bias was not expected to change significantly over time or from community to community. Its effect on data was expected to be consistent, and it was not expected to affect comparisons of data from this study with other studies employing similar methods. See the Data Analysis section below for additional discussion about the reliability of survey data.

Standardization in data collection procedures was complicated when several different people gathered data. One of the principal investigators was present throughout the administration of the survey and administered some surveys herself. This principal investigator was responsible for standardization and quality control, which were accomplished through the initial orientation process, daily reviews of surveys as completed, and post-administration review of all surveys. A second principal investigator independently reviewed the surveys before they were submitted for data entry.

A representative random sample was difficult to obtain in a community as culturally and economically diverse as Nome. For the sport fishing license group, a random sample was attempted. But, as discussed above, short-term residents were difficult to locate. As a result, sample three was biased towards long-term residents of Nome who were more likely to be known to the survey crew. This bias reduced researchers' confidence in expanded estimates of harvests, and they concluded it would be inappropriate to estimate total harvests for sample three. This report contains expanded harvest estimates for sample one (King Island community) and sample two (other Nome households), but reported harvests for sample three (sport fish license holders).

The Alaska Department of Fish and Game was often perceived as an enforcement agency. Although the Division of Subsistence's role in

ADF&G was to document subsistence uses, many residents perceived any ADF&G employee as a "game warden." Although this project was administered by Kawerak and almost all field contacts were made by Kawerak employees, ADF&G participation in the project may have discouraged some respondents from participating.

Researchers attempted to minimize enforcement bias limitations by thoroughly informing field researchers and respondents of the purpose of the surveys, of the intended use of the data, of the techniques used to protect household identities in published reports, and of respondents' right to refuse to participate in the survey. Information about individuals' activities was kept confidential. No data from this study were provided to any enforcement divisions of any of the participating agencies. Researchers returned survey results to the community, and involved members of the community in the review of this report.

Data Analysis

Survey data were entered in Microsoft Access, a database program, then read into SPSS, a statistical program for analyzing survey data. Most of the analyses were then conducted in SPSS, with tables and charts prepared using Microsoft Excel. Frequencies, means, cross tabulation, and multiple response procedures were used.

In addition to the harvest reports provided by respondents in this survey, Nome subsistence salmon harvest data for the 2001 season also were available from ADF&G's subsistence salmon permits. Researchers created a data file that included both survey and permit harvest data, and both types of data were used to calculate final reported and estimated harvests. In most cases, only one source of data was available for each household and those data were used in the final calculations. But 35 households in the survey sample (5 households in sample two, and 30 households in sample three) also obtained Nome subsistence permits (Fig. 4-2). Of those 35 households, 26 households returned their permits. Researchers compared the data from surveys and permits for each of the 35 households.

Ideally, permit and survey reports for each household would agree. But, as might be expected, they did not. The 35 households reported 928 salmon on the surveys, compared with 699 salmon on permits, a difference of 229 salmon. In comparing reports household by household researchers noticed the following patterns.

More households reported harvests through surveys than through permits. Households that had neglected to turn in permit reports were willing to report their harvests in a face-to-face interview. Some households that reported not fishing on subsistence permits reported subsistence harvests on their surveys. In most cases, these were rod and reel harvests taken under sport fishing licenses, and were not required to be reported on the permit system.

When permit reports existed, permit reports seemed more precise. For example, one household reported 17 chum, 35 pink, 8 sockeye, and 29 coho on its permit, compared with 10 chum, 25 pink, 30 sockeye, and 20 coho on its survey. The permit total was 89 salmon compared with the survey total of 85 salmon. This was logical because permit households were encouraged to record harvests on a daily calendar. For the survey, surveyed households were asked to recall their harvests several months later.

Researchers concluded that survey reports seemed more complete than permit reports, but permit reports seemed more precise. Therefore researchers decided to substitute permit reports for survey reports when both reports existed. Otherwise, researchers used the survey reports. This affected 3 households in sample two and 12 households in sample three, and slightly increased reported and estimated salmon harvests.

Merging the survey and permit data allowed researchers to calculate total estimates of Nome's salmon harvests. This provided a more complete perspective for evaluating the significance of Nome's harvests from areas outside the Nome permit area.

3
Setting

The community of Nome was a regional center of commerce, transportation, and government for the Norton Sound and Bering Strait area of northwest Alaska. Most of Nome's 3,505 residents lived in a compact townsite just east of the Snake River, on the southern shore of the Seward Peninsula, and facing the Bering Sea (Figure 3-1).

Founded during the gold rush of 1899, Nome evolved into a socially and economically diverse community during the 20th century. By the year 2000, more than half its population (59 percent) was Alaska Native or American Indian, primarily *Iñupiat* or *Yup'ik* Eskimo from the region. The remaining population included descendents of early mining families as well as more recent immigrants.

The area surrounding Nome was almost entirely treeless arctic tundra, except for intermittent spruce forests in the Fish River drainage. Most of the rivers that drained into Norton Sound near Nome were small; the Snake River was about 35 miles long, the Nome River was 40 miles long, the Eldorado River was 30 miles long, and the Sinuk River was 48 miles long. In normal water conditions the larger rivers were navigable by propeller-driven boats for only a few miles above their mouths. Smaller streams were marginally navigable except by outboard jet boats or canoes. Most rivers

Figure 3-1. Aerial view of Nome and the Bering Sea, 1993. Nome was a regional center of commerce and government. Although Nome was not connected to the rest of Alaska by road, three gravel roads began in Nome, reached about 75 miles east, west, and north across the Seward Peninsula, and provided access to the Kuzitrin and Fish river systems.

supported several runs of different species of Pacific salmon and, like salmon runs throughout western Alaska, most of these runs were in decline during the 1990s.

Residents of Nome hunted and fished extensively along the southern coast of the Seward Peninsula, in the Safety Sound watershed, and in the Kuzitrin and Fish River watersheds (Magdanz and Olanna 1986). Access to the country was facilitated by three state-maintained gravel roads that began in Nome and led east to Council, north to the Kougarok mining district, and west to Teller. Many smaller, unmaintained roads branched off the state road system to reach mines and camps throughout the area. No other community in northwest Alaska had such an extensive road system, and it facilitated summer access to areas that otherwise would have been difficult to reach from Nome.

This study explored how Nome residents have adapted to restrictions in the local subsistence salmon fisheries. To provide context for the findings, this chapter describes the setting for this study, the history of the area, the community of Nome at the time of the study, and the management of Nome area salmon fisheries.

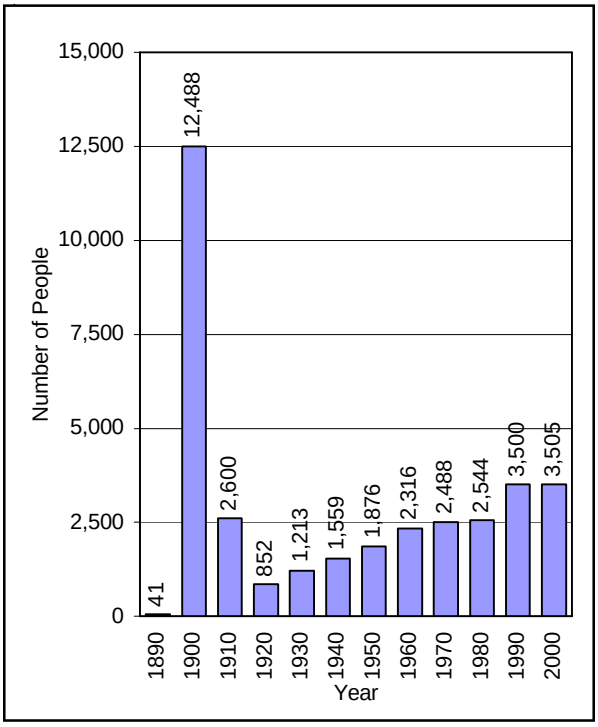

Figure 3-2. Population of Nome, 1890-2000. Nome's population reached its 20th century low in 1920, after the decline of the gold fields and an influenza epidemic.

History

Eskimo occupancy of the area began at least 4,000 years ago (Bockstoce 1979:88). Prior to the Nome gold rush in 1899, the Nome townsite had been seasonally inhabited by *Iñupiat* Eskimo and was known as Sitnasuak (Ray 1964:73). Twenty inhabitants were recorded in the 1880 census (Petroff 1884:11). A nearby site at the mouth of the Nome River, *Uinokhtuguik*, was inhabited by 10 persons in 1880 (Petroff 1884:11). The principal *Iñupiaq* settlements in the area were *Qipd'uq* (or *Asuucuryaq*), 15 miles east at Cape Nome with 60 inhabitants in 1880, and Ayuuq, 15 miles west on Sledge Island with 50 inhabitants in 1880 (Koutsky 1981:26, 27).

Smaller settlements, like those at the Nome and Snake rivers, occurred along the coast at productive locations. All these communities, including those at Nome's site, comprised either one society occupying the coast from Cape Douglas to Rocky Point (Burch 1980) or two related societies bounded at Cape Nome (Ray 1964, 1967). These societies were independent of Euro-Americans socially and economically until the gold rush began.

The community of Nome was founded on October 18, 1898, as a mining district on the Snake River (Collier, Hess, Smith, and Brooks 1908:18). In 1899, nearly 3,000 miners already in the North hurried to Nome. In 1900, as evidence of the rich gold deposits reached outside Alaska, more than 20,000 more people arrived. Residents voted to incorporate the City of Nome in April 1901, and Nome has been inhabited continuously ever since (Cole 1984:101). For the first few years of the twentieth century Nome was the largest city in Alaska (Cole 1984:101), but the richest placer deposits were worked out within a decade and its population quickly declined. Nome's population from 1890 through 2000 is illustrated in Figure 3-2.

The *Iñupiat* societies in the Nome area at historic contact were severely impacted by the gold rush and ceased to exist as societies by the early twentieth century. In 1918, the Eskimo

population in the Nome area was estimated to be 250, and of those, 200 died in an influenza epidemic (Cole 1984:136). Remnant survivors - mostly children - were scattered and the communities at Cape Nome and Sinuk River were abandoned. After 1918 Nome was the only permanent settlement on the central southern Seward Peninsula between Cape Nome and Port Clarence.

From its early days, Nome attracted other *Iñupiat* from the surrounding region. Labor was always needed for long-shoring, mining, and services. Some *Iñupiat* - especially from King Island and the Diomede Islands - made wage labor part of their seasonal round of economic activities. World War II temporarily boosted the local economy when Nome became a refueling stop for the lend-lease program that provided United States airplanes to the Soviet Union. Civilian job opportunities attracted more Iñupiat from area communities to Nome, but the military boom was temporary, too. Gradually, government came to be a mainstay of the regional economy, providing administrative, educational, medical, and social services to the Seward Peninsula and Norton Sound area. In 1983, state and local governments employed 1,159 Nome residents, compared with only 303 in 1969 (City of Nome 1985:19).

Nome in 2001

By 2001, what had once been a booming mining town had evolved into a multi-cultural service and retail center. It was a polyglot community with an Eskimo majority (59 percent). The minorities included whites (39 percent), blacks, Asians, and Hispanics. Nome produced for export small quantities of gold, reindeer, and seafood. It depended heavily on employment in government and tourism, and on non-commercial fish and wildlife harvested for family and personal consumption. Like most other rural Alaska communities, Nome exhibited extremes of employment, income, and housing. Some people were employed year round, were highly paid, and lived in expensive homes. Others were employed seasonally or not at all, were poorly paid, and lived in one-room plywood cabins.

Whatever their economic station, most families in Nome supplemented their diet with wild foods. A survey of a random sample of Nome houses conducted by the Division of Subsistence in 1982 found that 95 percent of the households used one or more wild foods (Wolfe and Ellanna 1983: 111). Approximately 65 percent reported using at least six different kinds of wild food (Wolfe and Ellanna 1983:105). The Alaska Geographic Differential Study found 93 percent of Nome area households used wild foods (Alaska Department of Administration 1985:201). Nome area households reported spending more than $1,400 annually on subsistence equipment, supplies, and transportation (Alaska Department of Administration 1985:202).

Nome has one of rural Alaska's most extensive road systems: three state-maintained, gravel roads lead into the country: 75 miles to Teller, 82 miles to Taylor in the Kougarok mining district, and 70 miles to Council. Figure 3-3 shows where the Teller road meets Port Clarence, just outside of the community of Teller. The roads connect with no others and terminate within the region, but have a considerable impact on wildlife harvesting patterns.

A 1986 Division of Subsistence study found that Nome's harvest areas were two to three times as large as harvest areas for other smaller communities in the region (Magdanz and Olanna 1986). The study indicated that roads facilitated harvesting, especially of moose and plants. Salmon fishing areas on four local rivers - the Sinuk, Snake, Nome, and Solomon - can be reached by road from Nome. Five more - the Cripple, Penny, Eldorado, Flambeau, and Bonanza - are accessible by boat (Figure 3-4). Except for the Snake (which was small and tainted by city sewer discharge), the Nome River was the closest river to Nome. The Kougarok road parallels the Nome River almost its entire 41-mile length, one bridge crosses less than a mile above its mouth, and another crosses about 13 miles inland. Most fishing by Nome residents occurred in Subdistrict 1 (Nome) of the Norton Sound District, which included all waters

Figure 3-4. The Bob Blodgett Nome-Teller Road. State-maintained roads like this one from Nome to Teller allowed Nome residents access to adjacent areas for hunting and fishing. The Nome-Teller road ended in downtown Teller, and paralleled the Grantley Harbor beach, above, for approximately one mile. Teller is visible in the background.

draining into Norton Sound from Penny River to Topkok Head.

The Nome River has been an especially attractive fishing location to newcomers, who had not yet learned their way around the country or who did not have the necessary equipment to reach some other rivers. During the first 17 years, permit data showed that the Nome River attracted the most effort, but effort declined substantially after 1986. The Eldorado and Flambeau rivers were the second most heavily fished river systems from 1975-91. After the Nome River decline, the Eldorado and Flambeau rivers became the most heavily fished river system in the Nome subdistrict.

During the 1980s and 1990s, the state gradually improved the Nome road system. As access improved, several Nome families began maintaining summer homes in Council, on the Niukluk River, a tributary of the Fish River. Some of them also fished in the Council area. As local Nome salmon fisheries declined, some Nome families also began driving up the Kougarok Road to fish in the Pilgrim River, a tributary of the Kuzitrin. Other families began driving up the Teller Road to fish in Grantley Harbor and the lower Kuzitrin River. Documenting the nature and extent of these expanding fishing efforts was one of the primary goals of this project.

Salmon Fishery Management

At the time of this study, both the state and federal governments managed salmon fisheries in the Norton Sound area. The Federal Subsistence Board managed subsistence salmon fishing in navigable waters on federal public lands, while the state managed subsistence salmon fishing in all other areas. Kawerak Inc., the Alaska Native non-profit regional corporation based in Nome, was an active cooperator in both state and federal management. Kawerak's Natural Resources Department operated projects that provided information about salmon abundance and subsistence harvests, consulted with agency managers on agency management decisions, and participated in the government regulatory

Figure 3-4. Eldorado River fish camp. A Nome family's fish camp near the mouth of the Eldorado River, about 20 miles east of Nome. This area often was closed to salmon fishing during the 1990s and early 2000s, and some residents drove from Nome to adjacent communities like Council and Teller to harvest salmon for subsistence.

processes through boards, councils, and committees.

The federal government's involvement in management began in territorial days, and focused primarily on commercial fisheries. There were no records of active federal management in Nome area subsistence fisheries prior to statehood in 1959, except for a region-wide survey of subsistence harvests (Raleigh 1957).

The State of Alaska began managing commercial and subsistence salmon fisheries in the Nome area in 1960, and established two fishery management districts in the area. The Norton Sound District included all waters between the westernmost tip of Cape Douglas and Canal Point Light, and was divided into six subdistricts. Subdistrict 1 included waters in the vicinity of Nome; subdistrict 2 included Golovnin Bay and its drainages; subdistrict 3 included waters in the vicinity of Elim and Moses Point; subdistrict 4 included waters in the vicinity of Koyuk; subdistrict 5 included waters in the vicinity of Shaktoolik; and subdistrict 6 included waters in the vicinity of Unalakleet. The Port Clarence District included all waters of Alaska between the westernmost tip of Cape Prince of Wales and the westernmost tip of Cape Douglas, and was not divided into subdistricts.

The State of Alaska managed salmon fishing under three different sets of regulations: subsistence, commercial, and sport. The application of these regulations depended upon the disposition of the catch and the gear used.

1 "Subsistence" was defined as "the noncommercial, customary and traditional uses of wild renewable resources for direct personal or family consumption..., for the making and selling of handicraft articles..., and for the customary trade, barter, or sharing..." (AS 16.05.940) Any Alaska resident could participate in a state-managed subsistence fishery (i.e. participation was not limited to indigenous

or local rural residents). No license was required.

2 "Commercial fishing" was defined as fishing "with the intent of disposing of (fish) for profit, or by sale, barter, trade, or in commercial channels." (AS 16.05.940) Commercial salmon fishing was limited to people who owned a "limited entry permit." Otherwise, any person could participate in commercial fishing; a commercial permit was required.

3 "Sport fishing" was defined as fishing for personal use with a rod and reel. (AS 16.05.940). Any person could participate in sport fishing; a sport fishing license was required.

In most of northwest Alaska, subsistence salmon fishing was allowed seven days a week and there were no harvest limits. The exceptions were Norton Sound subdistricts 1 (Nome) and 6 (Unalakleet) and the Port Clarence District, which were closed to salmon fishing for one or more days during the week. In some areas in the Nome and Unalakleet subdistricts, gillnets were limited in length during part or all of the fishing season. In the Nome subdistrict, a number of upstream areas were closed entirely to salmon fishing to protect spawning salmon.

In 1999, as the result of several lawsuits, management of subsistence salmon fishing on navigable federal waters adjacent to federal public lands reverted to the federal government. Since then, most salmon fisheries around the state have been subject to "dual management," involving both federal and state managers, federal and state boards, and often cooperative groups of fishers as well.

The waters in the immediate vicinity of Nome were managed by the state, but portions of the Kuzitrin and Fish river watersheds were subject to management by the federal government, as was much of the Unalakleet River. Consequently, shifts in effort from the state managed subsistence salmon fisheries in the Nome subdistrict potentially could affect subsistence fisheries in adjacent areas that were subject to federal management.

Salmon Fishing in the Nome Subdistrict

The Nome subdistrict was by far the most heavily restricted subsistence salmon fishery in the region (Figure 3-4). Table 3-1 lists some of the state regulations that have affected subsistence fishing in the Nome subdistrict. Permits were instituted in 1974, and have been the basis both for managing fishing and for reporting harvests since then. These permits included a catch calendar to be returned at the end of the season. Fishing households were asked to record their catches by date and species, and to indicate the type of gear used. Each household was entitled to one permit. The permit authorized a household to catch a specified number of salmon from a particular river. Permits could be transferred from river to river.

The abundance of salmon species in the Nome area has varied over time. Pink salmon abundance has alternated on a two-year cycle, with strong even-year runs and weak odd-year runs. Coho salmon abundance, negligible before the mid 1970s, increased through the 1980s, and was decreasing in the late 1990s. Chum salmon abundance declined substantially in the late 1970s, and failed to respond to rebuilding efforts during the 1980s and 1990s, and only recently began achieving escapement goals in some streams. The largest run of sockeye in the area was in Salmon Lake, but that run was depressed from the mid 1970s through the late 1990s, when it finally responded to a lake fertilization program and beginning to rebuild in the early 2000s. Chinook salmon were present, but not abundant in the area.

Beginning about 1980, the Alaska Department of Fish and Game became particularly concerned about chum salmon returns to the Nome subdistrict. Commercial fishing was drastically curtailed in the mid-1980s. Runs did not recover as expected, and in the early 1990s the department increased restrictions on the subsistence fishery, primarily by managing fishing time through emergency orders.

In regulation, subsistence fishing the Nome subdistrict was open four days a week, and salmon harvests were limited in all subdistrict streams. Throughout the 1990s, subsistence

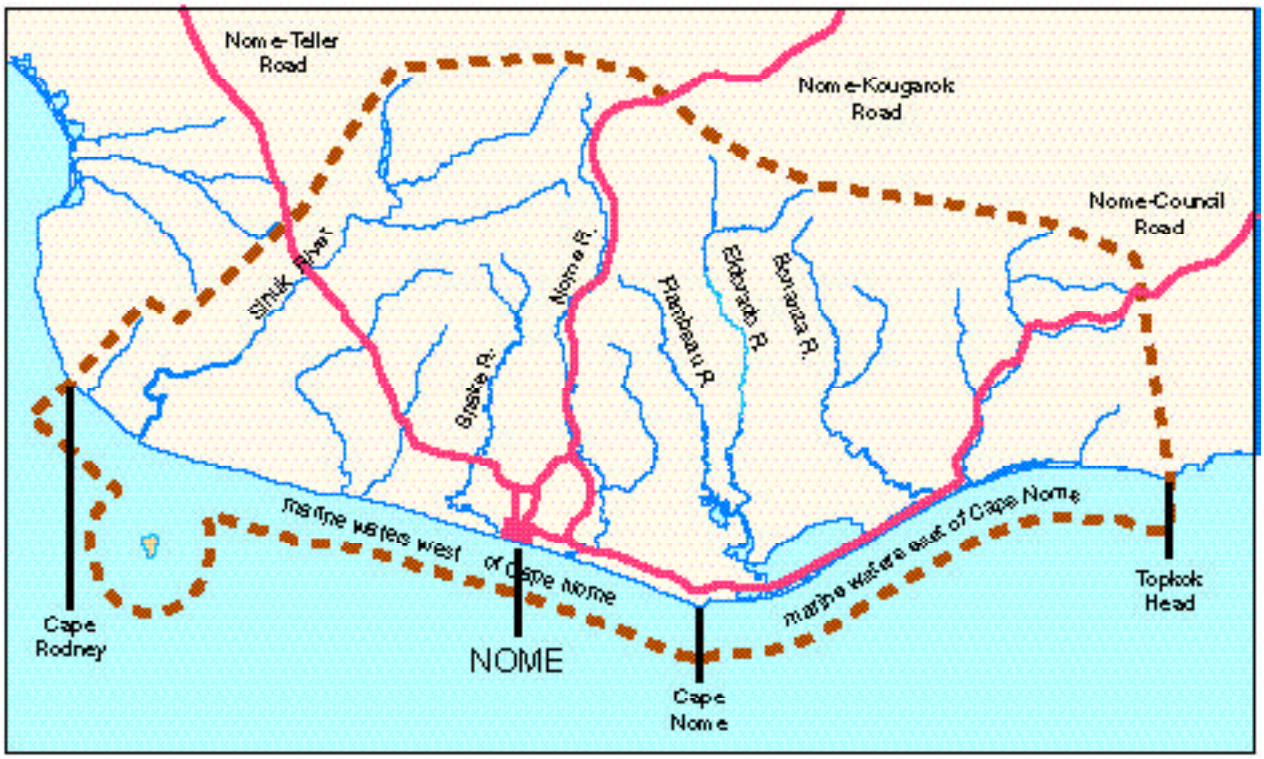

Figure 3-5. Nome Subdistrict. Households fishing any waters in the Nome subdistrict were required to first obtain a subsistence fishing permit from the Alaska Department of Fish and Game. First issued in 1974, Nome salmon permits usually were issued either for the ocean or for a particular river. Salmon harvests in the river were limited, usually to 100 salmon. Salmon harvests in the ocean usually were not limited

salmon fishing in the Nome subdistrict was closed during much of the chum salmon run to help rebuild depressed stocks.

Figure 3-6 summarizes the subsistence permit harvest records from 1975 through 2001. During that period, Nome's subsistence salmon harvest included primarily three species: pink salmon (52 percent), chum salmon (38 percent) and coho salmon (9 percent). Reported subsistence harvests peaked in 1980, when 30,515 salmon (73 percent pink salmon) were harvested. Chum harvests peaked in 1977, when 12,192 chum were harvested. The cyclical abundance of pink salmon was evident. In even-numbered years, pink salmon comprised 65 percent of the average annual subsistence salmon harvest in the Nome subdistrict (Figure 3-7). In odd-numbered years, pink salmon comprised only 31 percent of the average annual harvest.

From 1975 to 2001, on average, Nome residents harvested 10,731 salmon annually from the Nome subdistrict. In the decade from 1992 to 2001, Nome's average annual subsistence salmon harvest fell by half, to 5,196 salmon. These declines were the result of declining stocks and increasingly restrictive management intended to protect those stocks. They posed considerable difficulties for Nome families with a history of dependence on salmon for food.

In the late 1990s, the Alaska Board of Fisheries became more actively involved in Nome salmon fisheries. Meeting in Nome in March 1998, the board created a Nome Salmon Working Group to advise the board on how to manage Nome area fisheries (Nome Subsistence Salmon Working Group 1999). When the board returned to Nome in March 1999, the board heard the group's report and considerable public testimony. After reviewing historical harvest data, the board determined that 3,430-5,716 chum salmon were necessary for subsistence in the Nome subdistrict. The expected harvestable surplus of chum was only 2,000. Consequently, the board adopted Tier II regulations, and the department began to manage chum salmon in the Nome subdistrict under Tier II.

TABLE 3-1. CHRONOLOGY OF SELECTED FISHING REGULATIONS AFFECTING THE NOME AREA, 1961-2001

Date	Regulation
1961	Seines or nets with stretched mesh smaller than 4 l/2" prohibited in the Nome River above Osbom and in the Snake River.
1962	Six subdistricts created in Norton Sound district for management purposes. Nome subdistrict open to commercial and subsistence fishing seven days a week.
1965	Subsistence catch calendars or questionaires distributed in the Nome area for the first time.
1968	Permits required to fish in the Nome, Sinuk, Snake and Solomon rivers. Limit: 500 salmon per permit.
1969	Subsistence fishing in Norton Sound put on same schedule of openings and closures as the commercial fishery. Nome subdistrict still open seven days a week.
1972	Salmon fishing prohibited in Salmon Lake from July 15 to August 31.
1973	Commercial fishing in Nome subdistrict restricted to four days a week. Subsistence fishing restricted because of 1969 regulation, above.
1974	Subsistence permits required to fish in the Norton Sound District from Cape Douglas to Rocky Point and in the Port Clarence District in the Pilgrim River drainage including Salmon Lake
1976	Permit limits in Nome River reduced from 500 to 100 salmon.
1977	Nome subdistrict periods reduced to two 24-hour openings per week, then closed July 9. Commercial salmon fishing is limited by CFED permit.
1980	Board of Fisheries sets commerical fishery guideline harvest of 5,000 to 15,000 chum. Subsistence salmon permit limits increased from 100 to 250 salmon on the Nome River.
1984	The Nome River from its mouth upstream for 200 yards is closed to fishing.
1984	Subsistence permit limits for chum and coho salmon reduced to 20 chum and 20 coho salmon for the Snake and Nome rivers. Remainder of 250-salmon limit can be filled with pink salmon.
1988	Seines or nets with stretched mesh smaller than 4 l/2" prohibited in the Nome River. In the Nome River, no person may operate more than 50 feet of gill net.
1992	No person may operate more than 50 feet of gill net in freshwater in the Nome Subdistrict.Seining can be directed on species other than chum or pink.
1994	Subsistence fishing in marine waters in Nome Subdistrict open Monday-Friday
1999	Determined 3,430-5,716 chum salmon were necessary for subsistence. Tier II fishery established for chum salmon.
2001	Optimum Escapement Goals (OEGs) established for Nome, Eldorado, and Snake Rivers.

Source: Alaska Board of Fisheries regulation booklets and Department of Fish and Game pemit records.

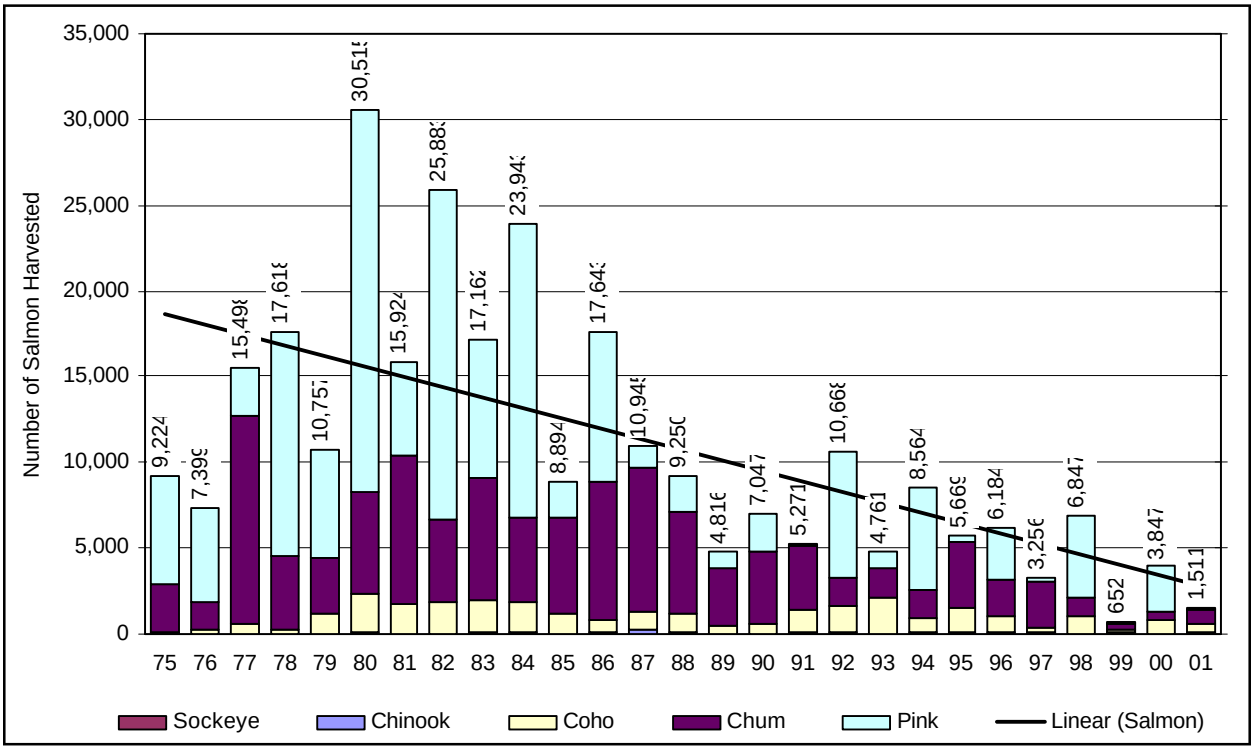

Figure 3-6. Subsistence salmon harvests reported by permit for the Nome subdistrict, 1975-2001. Harvests have been declining since 1980 as abundance declined. Widespread closures began in 1991. Tier II for chum began in 1999.

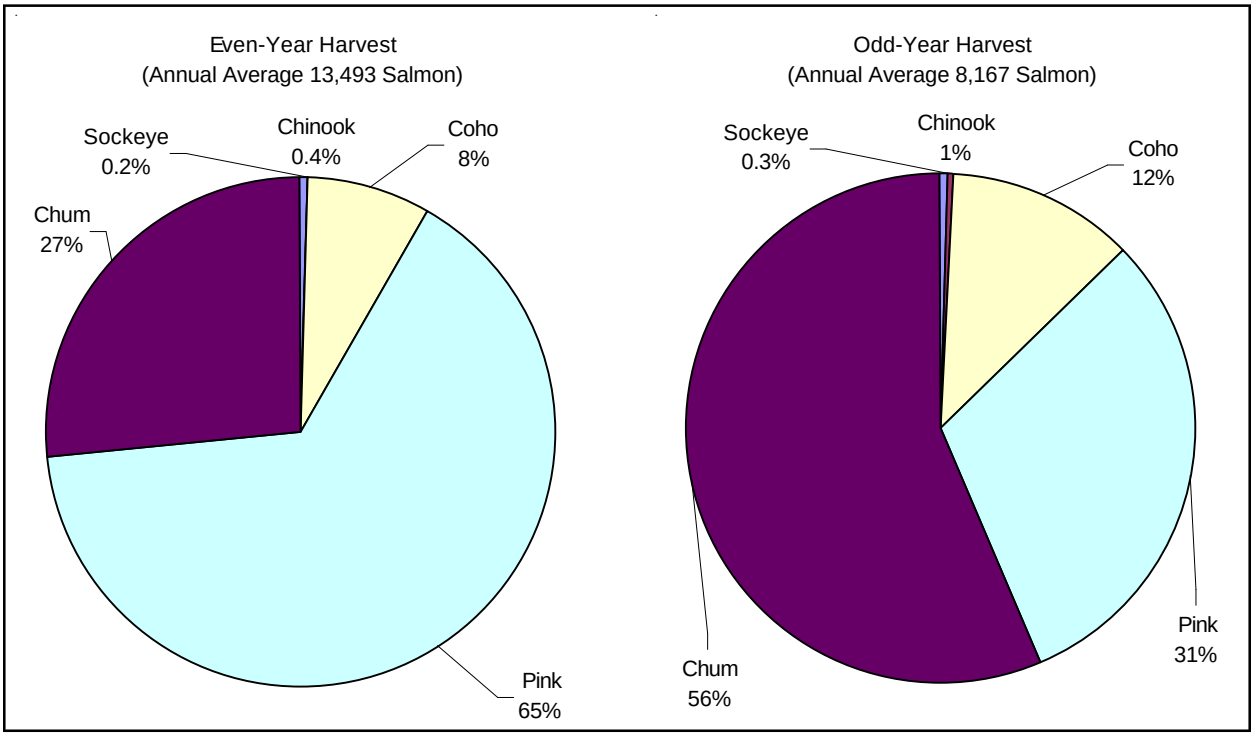

Figure 3-7. Species composition of subsistence harvests in the Nome Subdistrict,1975-2001. Pink salmon abundance varies on a two-year cycle, with high abundance in even-numbered years and moderate abundance in odd-numbered years. The proportion of pink salmon in the subsistence harvest approximately doubled in even-numbered years (left). Chum proportions doubled in odd-numbered years (right).

Under Tier II, not everyone who wanted to fish was able to do so. The subsistence law directed the Board to give a priority to those who had the greatest customary and direct dependence and the fewest alternative resources. To measure those factors, the Board - in cooperation with the Nome Salmon Working Group, the Alaska Department of Fish and Game, and the Nome public - developed two questions.

The first question asked applicants: "How many years have you fished or processed subsistence-caught chum salmon from the Nome Subdistrict? Applicants were awarded one point for each year of fishing history, to a maximum of 75 points." The second question asked applicants: "How much of your chum salmon came from the Nome Subdistrict during the past four years?" The more chum that came from the Nome Subdistrict, the more points were awarded, up to a maximum of 10 points.

People who wanted to fish chum salmon in the Nome Subdistrict had to fill out an application each spring, and answer these two questions. Applicants were scored and ranked, and the top 10 or 20 ranking households got permits.

In 1999, the first year of Tier II, 81 households applied for the available 20 Tier II permits. The next year, 2000, a weaker chum salmon run was predicted, so managers began the season with only 10 Tier II permits available. The number of applicants for Tier II permits dropped from 81 to only 30. Fifty-eight households who had applied in 1999 did not apply in 2000, including 13 of the households who had successfully applied the year before. Seven households which had not applied in 1999 decided to apply in 2000. Of the ten permits, seven went to households that had received permits in 1999, two went to households that had applied in 1999 but had been unsuccessful, and one went to a new applicant household.

Why were there so few applicants in 2000? First, some low-scoring 1999 applicants did not reapply in 2000. Second, salmon returns in 1999 were worse than expected. Subsistence salmon harvests were the lowest on record, and Tier II fishing families did not get as much fishing opportunity as had been expected. That no doubt discouraged many people. Of the 20 Tier II permit holders in 1999, only 6 actually fished. Of the 87 Tier I permit holders in the Nome subdistrict, only 19 fished. That was by far the lowest effort ever seen in the Nome subdistrict since permitting began in 1974. Indeed, almost as many people fished outside the Nome Subdistrict as in it.

There were several reasons that Nome residents would be attracted to areas outside the Nome subdistrict. First, access was relatively easy. Using any one of three state-maintained gravel roads, Nome residents could pull a boat on a trailer from Nome to a boat launching site in one of these adjacent areas in about two hours.

Second, rivers in the adjacent watersheds were larger than those in the vicinity of Nome. The major streams in the Nome Subdistrict ranged in length from about 33 miles (Eldorado River) to about 48 miles (Sinuk River).

By comparison, the Fish River, the next watershed to the east, was about 75 miles long. Its major tributary, the Niukluk River, was about 53 miles long, longer than the longest stream in the Nome Subdistrict. The Kuzitrin River, the next watershed to the west, was about 95 miles long. Its Pilgrim River (about 50 miles long) and Kougarok River (at least 48 miles long) tributaries were also as long as the longest rivers in the Nome Subdistrict.

Third, salmon stocks in the Fish and Kuzitrin systems were more abundant than salmon stocks in the Nome subdistrict. Especially attractive were the sockeye salmon from Salmon Lake at the headwaters of the Pilgrim River. Decimated by over fishing in the 1970s, Salmon Lake sockeye were responding to a fertilization project in the mid 1990s, and were becoming a significant part of Nome's subsistence harvest again. Except for a small stock in the Sinuk River, sockeye were not present in Nome Subdistrict streams.

Fourth, and perhaps most important, competition was less in the adjacent areas. Consequently, there were no harvest limits or closed waters in the adjacent areas. Nome residents, like residents of smaller communities in the adjacent areas, could harvest as many salmon as they needed where ever they wished in the adjacent areas.

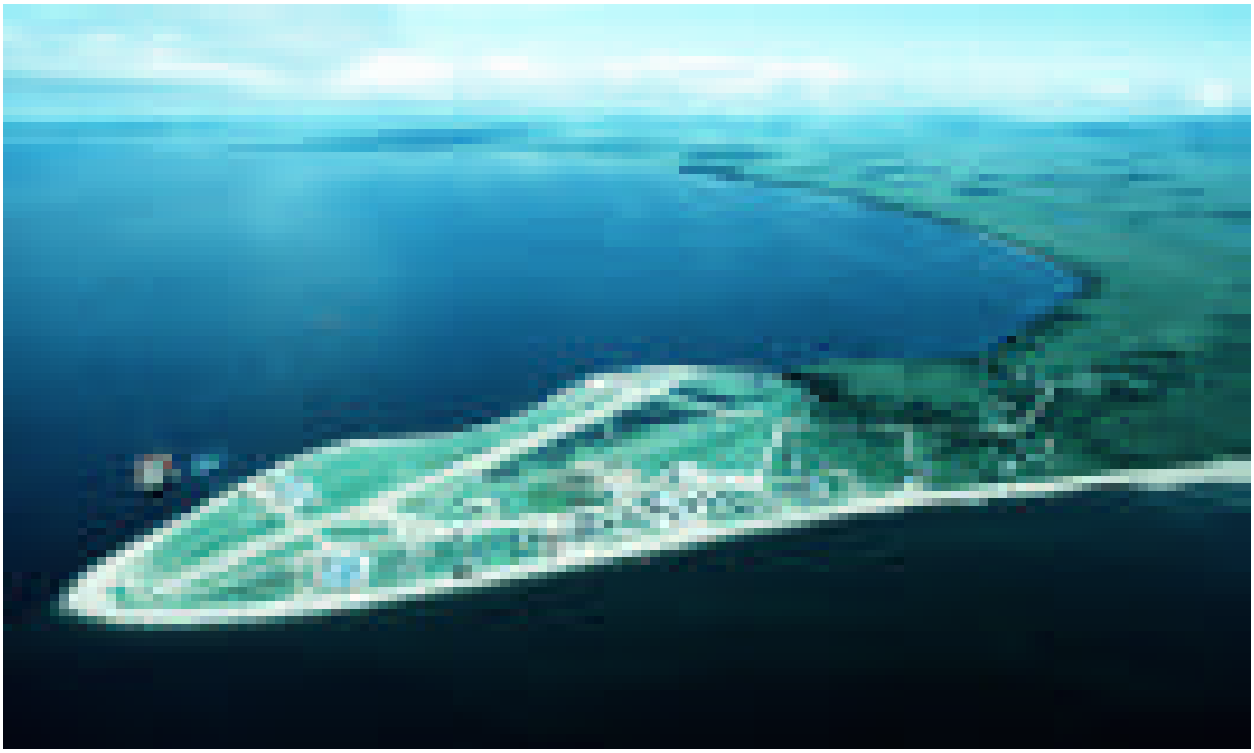

Figure 3-9. Golovin, Alaska. The community of Golovin is on a spit separating Golovnin Lagoon (background) from Golovnin Bay (foreground).The community name and the water body names are spelled differently, the result of a misspelling in a Post Office application. A new airport has been built since this picture was taken in 1982.

The shift in fishing effort by Nome residents away from the Nome subdistrict into adjacent watersheds raised concerns among managers and in adjacent communities. What effects would Nome's fishing have on fishing opportunities for residents of the adjacent areas? Subsistence harvests and fishing periods had rarely been limited in these other areas through 2001. Would a shift in Nome's effort result in increasing restrictions for outlying fisheries?

The White Mountain-Golovin Area

The White Mountain-Golovin area bounds the Nome Subdistrict on the east and northeast, and includes two permanent communities. White Mountain is on the east bank of the Fish River about 10 miles (20 river miles) above the river mouth. Golovin is on the east bank of Golovnin Bay, on a spit separating Golovnin Lagoon from Golovnin Bay (Figure 3-8).

In the 19th century, the White Mountain-Golovin area was inhabited by two societies, *Unalik Yup'ik* speakers who resided in the Golovnin Bay portion, and *Qawiaraq Iñupiaq* speakers who resided in the Fish River portion (Koutsky 1981b:8). In the 20th century, descendents of these two societies settled in Golovin and White Mountain, respectively. Intermarriages between the two societies was common, so descendents of the two societies can be found in both Golovin and White Mountain. At the time of this study, all residents spoke English.

In the 19th century, the major communities in the Golovnin Bay portion were believed to be *Ikñiituq*, west of Golovnin Lagoon and *Atnaq* at Cape Darby (Koutsky 1981b:13). In the 1880 census, Petroff reported 100 people at *Ikñiituq* and 20 people at *Atnaq*. In the 2000 census, Golovin's population was 144 people (U.S. Census Burreau 2001:143).

In the 19th century, the most prominent Fish River community was *Iíaƛuit*, near the mouth of the Niukluk River, approximately 16 river miles above the current site of White Mountain (Koutsky 1981b: 32-34). Ray estimates the Fish

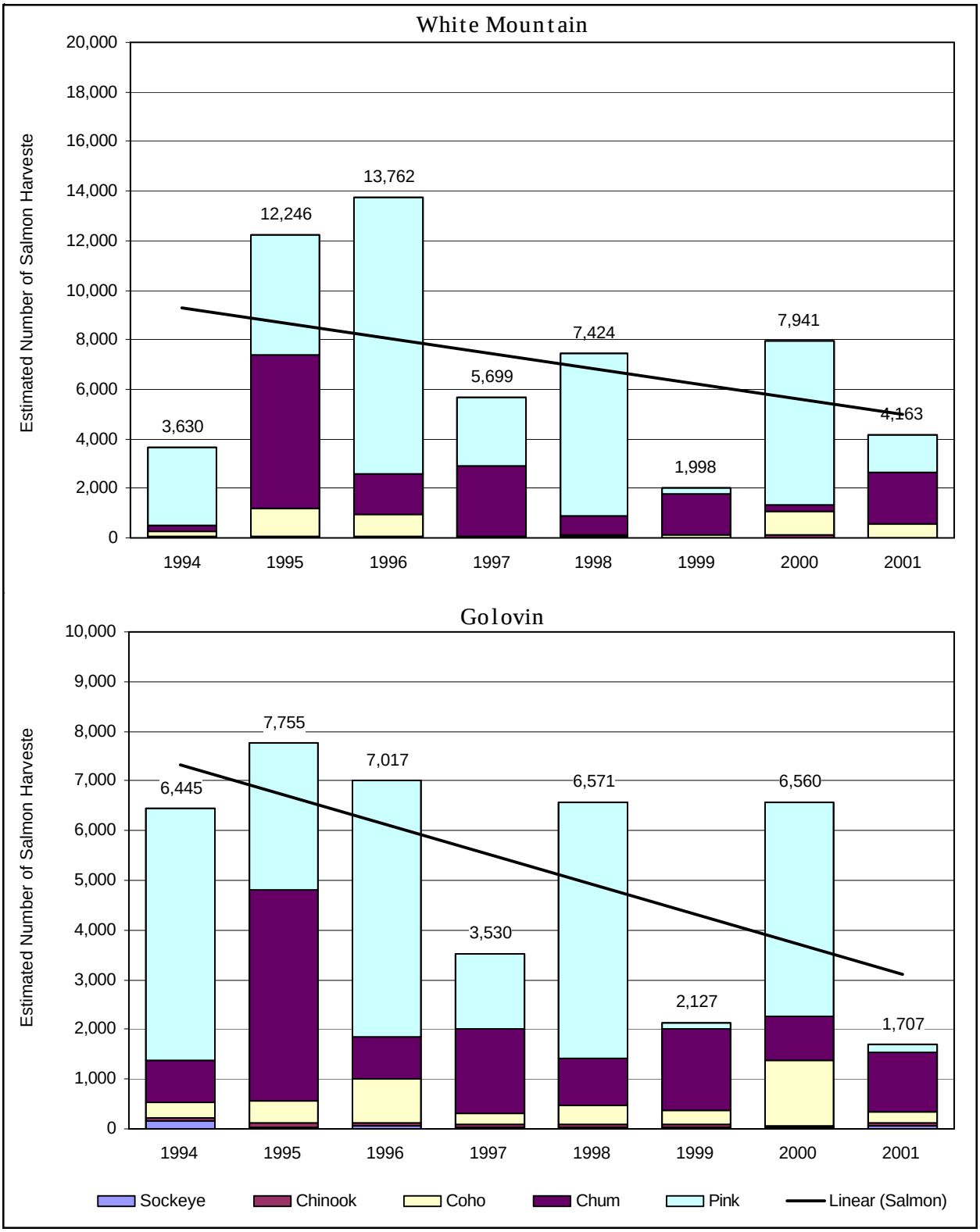

Figure 3-9. Estimated subsistence salmon harvests, White Mountain and Golovin,, 1994-2001.Since 1994, salmon harvests in smaller Norton Sound communities have been estimated through community survey projects. Survey data show declining total subsistence salmon harvests in both White Mountain and Golovin over the past eight years.

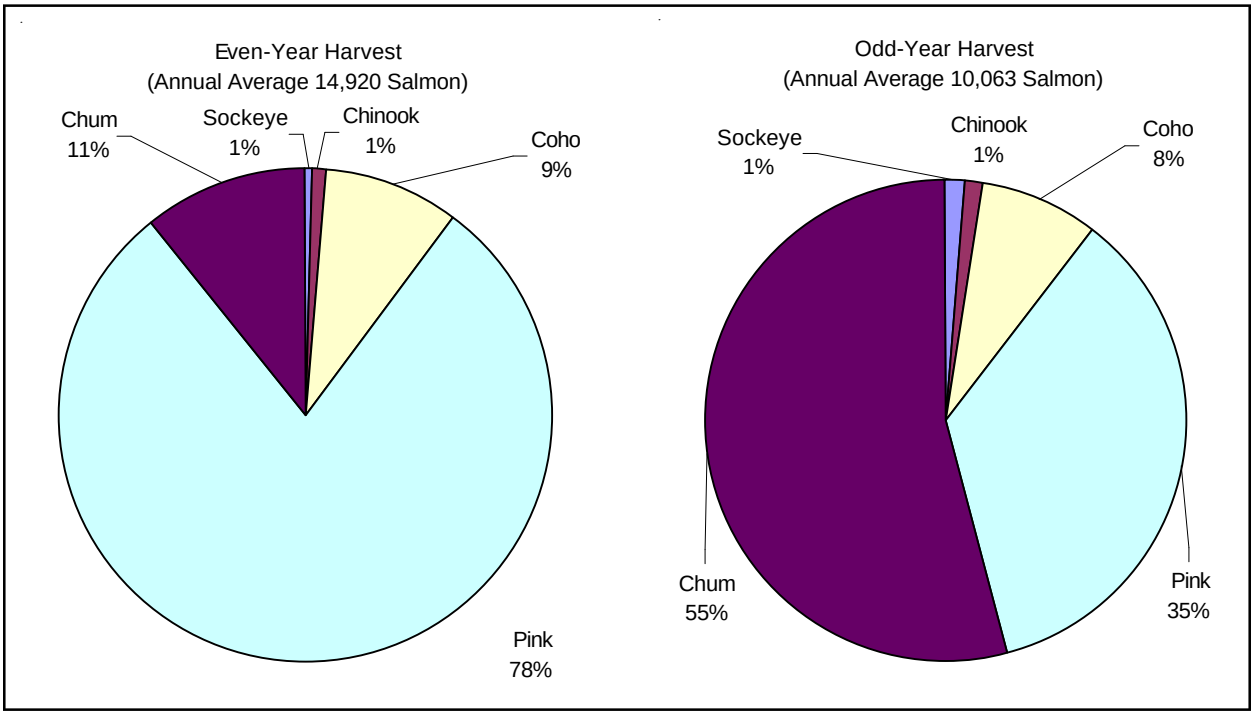

Figure 3-10. Composition of salmon harvests in White Mountain and Golovin, 1994-2001. Salmon harvests in even-numbered years are 50 percent larger than in odd-numbered years, the result of cyclic abundance of pink salmon. Chum abundance was not as varied, but chum harvests nonetheless cycled in opposition to pink harvests..

River population in 1850 to have been about 50 people (Ray 1984:295). White Mountain's population in the 2000 census was 203 people (U.S. Census Bureau 2001:368).

Most Nome residents reach the Fish River system by driving the Nome-Council road 70 miles to Council, then taking a boat down the Niukluk River from Council to its confluence with the Fish River, distance of about 12 miles. In most years, the Niukluk River is too shallow during the salmon season to use a propeller-driven boat, so Nome residents use outboard jet motors.

During the first two decades of the 20th century, Council was an important mining community with as many as 300 people. Its population declined to 109 residents by 1920, and since then varied between zero and about 50. During the 1980s and 1990s, Council was reborn as a seasonal, recreational community for Nome residents. Some Nome residents purchased and rehabilitated the old mining cabins; others purchased lots and built new cabins. These are all "second homes," however. The 2000 census reported no permanent residents in Council.

Figure 3-9 shows estimated subsistence salmon harvests by residents of White Mountain and Golovin, based on information from household surveys conducted by the Alaska Department of Fish and Game and Kawerak Inc. (Georgette et al 2002). Overall, salmon harvests were declining in both communities; harvests at the beginning of the survey period were almost twice as large as harvests at the end of the survey period, reflecting declines in pink salmon harvests. Note in particular how few pink salmon were harvested in 1999 and 2001.

As in the Nome subdistrict, the cyclical abundance of pink salmon influenced the pattern of subsistence harvests in the White Mountain-Golovin area. Figure 3-10 shows the average composition of subsistence salmon harvests in even-numbered and odd-numbered years for White Mountain and Golovin. In the even years (1994, 1996, 1998, and 2000), pink salmon comprised 79 percent of the total salmon harvest. In the odd years (1995, 1997, 1999, and 2001)

pink salmon comprised only 35 percent of the total. The abundant pink salmon seem to buffer the harvest of chum salmon. In even years, chum harvests averaged 1,634 fish (11 percent of the total). In odd years, chum harvests averaged 5,451 fish (35 percent of the total). Other salmon species' harvests were not so cyclical.

The Port Clarence Area

The Port Clarence area bounds the Nome Subdistrict on the west and northwest and, like the White Mountain-Golovin area, includes two permanent communities. Teller is on a narrow spit that separates Grantley Harbor from Port Clarence. Brevig Mission is on the north shore of Port Clarence, above five miles northwest of Teller. In this study, researchers focused on the community of Teller, which is closer to Nome and connected by road to Nome, and would be expected to feel effects of Nome residents' fishing before the community of Brevig Mission.

In the 19th century, the Kuzitrin watershed in the eastern Port Clarence area was occupied by the *Qawiaraímiut* society, whose central community was *Qawiaraq* on the Kuzitrin River (Koutsky 1981a:11, 29). Ray estimates their population to have been about 80 people in 1850 (Ray 1984:295).

Also in the 19th century, Port Clarence was occupied by the *Sináamiut*, whose communities were spread along the Bering Sea coast from Cape York to Cape Douglas, in Port Clarence itself, Imuruk Basin, Tuksuk Channel, and as far inland as the American and Agiapuk rivers. This area includes both the modern communities of Teller and Brevig Mission.

In the 19th century, the *Sináamiut* were host to a major trading fair each summer, held at Point Spencer, the tip of the long peninsula separating Port Clarence from the Bering Sea (Ray 1975:98). The *Iñalik* from Little Diomede Island also came to the Port Clarence area to trade and to fish, and presumably had alliances with families in the *Qawiaraímiut* and *Sináamiut* societies. Several *Iñalik* families settled in Teller during the 20th century.

The *Qawiaraímiut* and the *Sináamiut* had more opportunities than some other 19th century societies to come into contact with Europeans and Euro-Americans. The *Plover*, an English ship searching for Sir John Franklin, spent two winters, 1850-51 and 1851-52, frozen in the ice at Grantley Harbor (Great Britain Sessional Papers 1852-53). The next winter, the *Rattlesnake*, an English supply ship spent the winter in Port Clarence, and sent an expedition overland to Wales (Great Britain Sessional Papers 1853-54).

In 1866, the Western Union Telegraph expedition established a base camp on the north side of the channel between Port Clarence and Grantley Harbor. The natural harbor of Port Clarence attracted Yankee whalers, who established a coal station near Point Spencer in 1884 (Healy 1887:13). Reindeer were introduced to Alaska in 1892 near the site of Brevig Mission (which was known as "Teller Mission" until it was renamed in the 1950s to avoid confusion with nearby Teller).

After the discovery of gold in Nome in 1898, prospectors swarmed over the Seward Peninsula. More modest quantities of gold were discovered in the Teller area, and by 1900 Teller's population had swelled to 5,000 people. By 1910, Teller's population had diminished to 125. Teller's population declined further after the 1918 influenza epidemic, reaching a low of only 80 people in 1920. Teller grew in the 1940s and 1950s, reaching 217 people in 1960. Since then, Teller's population ranged between approximately 150 and 250 people. At the time of this study, Teller was home to 269 people, the majority descended from the original *Qawiaraímiut* and *Iñalik* families.

For the first half of the 20th century, Brevig Mission was known as "Teller Mission." The name was changed in the 1950s to end confusion with nearby Teller and to honor one of the community's early missionaries. Brevig Mission's population in 2000 was 276 people. A significant majority of Brevig Mission's population was descended from a large family that moved to Brevig Mission in the 1940s from Shishmaref. Other residents were descended from Port Clarence area people, although researchers did not know whether *Sináamiut*

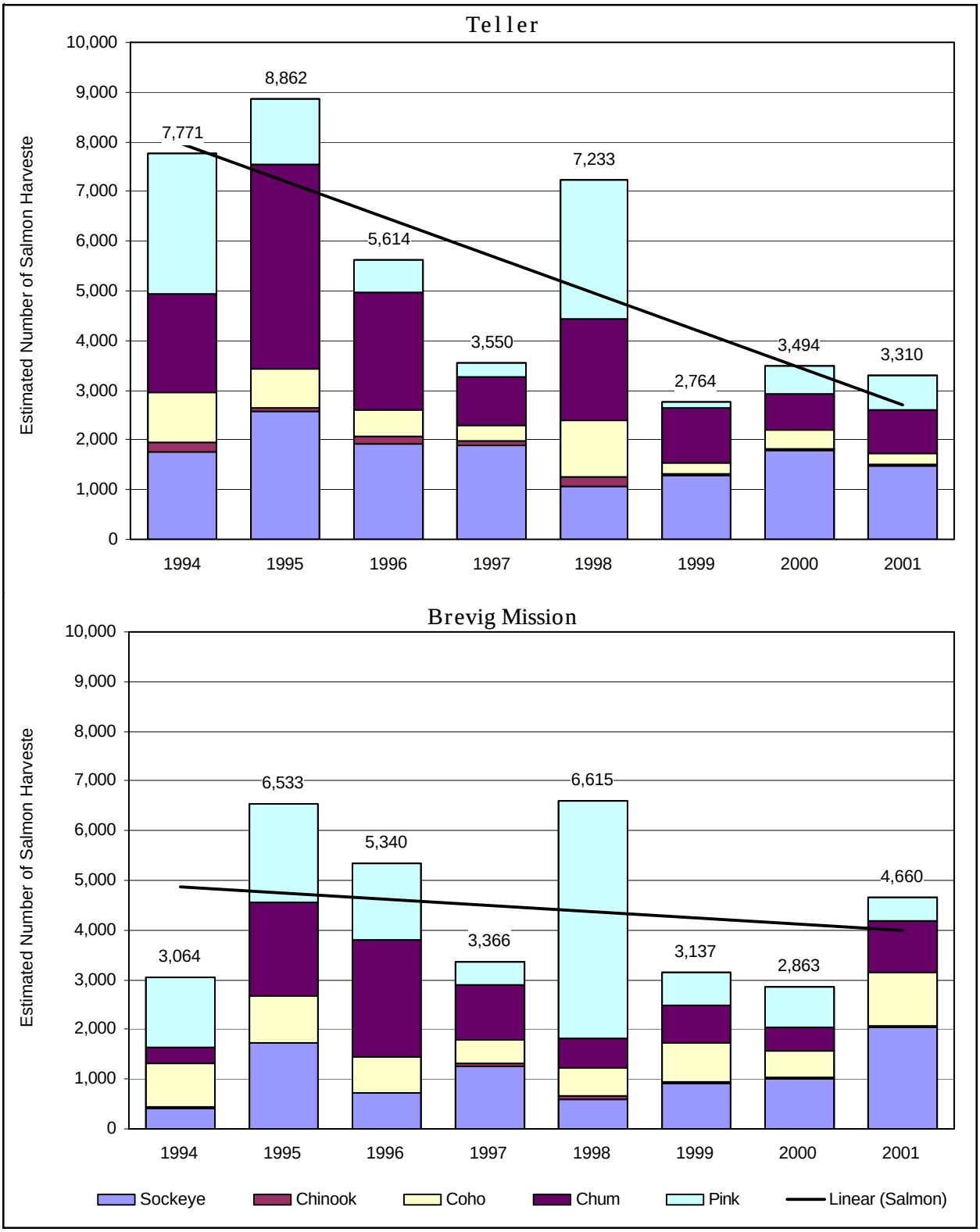

Figure 3-11. Estimated subsistence salmon harvests, Teller and Brevig Mission, 1994-2001. The substantial contribution of sockeye salmon to the subsistence harvests was evident in both Teller and Brevig. Pink and chum harvests have declined since the mid 1990s; the decline was much more pronounced in Teller than in Brevig Mission.

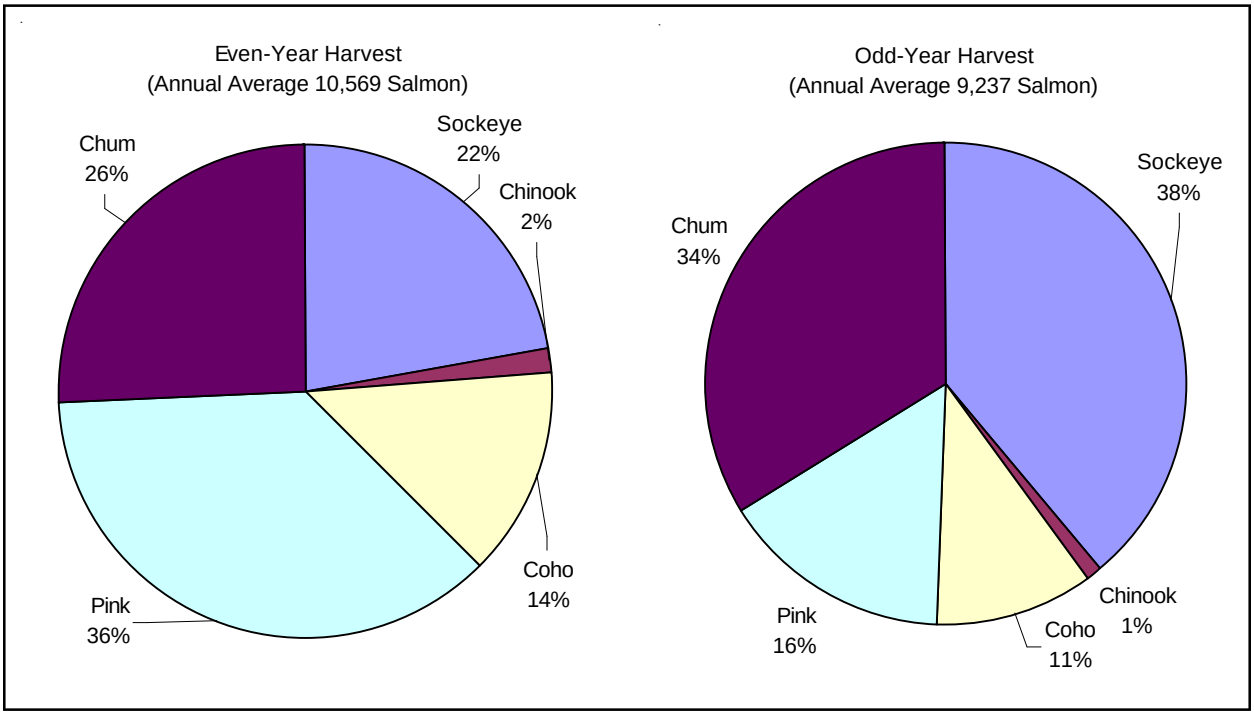

Figure 3-12. Composition of salmon harvests in Teller and Brevig Mission, 1994-2001. With the addition of sockeye, residents of Teller and Brevig Mission had a more varied salmon harvest than other Norton Sound communities. Sockeye and chum comprised similar proportions of the harvest. The variation in pinks was similar to other areas.

descendents ultimately settled in Brevig Mission, or were lost in the epidemics of 1900 and 1917.

Figure 3-11 shows estimated subsistence salmon harvests by residents of Brevig Mission and Teller, based on information from household surveys conducted by the Alaska Department of Fish and Game and Kawerak Inc. (Georgette et al 2001). The consistent and substantial contribution of sockeye salmon to the subsistence harvest was evident in both communities. Sockeye were not abundant in the nearby Norton Sound District. Teller's total subsistence salmon harvest appeared to be declining over the survey period, while Brevig Mission's remained approximately the same. The decline in Teller was attributable primarily to declines in chum and pink salmon harvests.

Figure 3-12 shows the average species composition of subsistence salmon harvests in even- and odd-numbered years for Teller and Brevig Mission. Pink salmon harvests in the Port Clarence area varied as they did in the Nome permit area and White Mountain-Golovin area, comprising twice as much of the harvest in even-numbered years as in odd-number years. But overall harvests varied less between odd- and even-numbered years, partly because of the consistent harvests of sockeye.

4
Findings: Nome Salmon Harvests in 2001

From 1994 to the present, two different methods have been used to estimate salmon harvests in the Norton Sound-Port Clarence Area. In smaller communities, Alaska Department of Fish and Game and Kawerak staff conducted household surveys at the end of the salmon fishing season (Georgette et al 2002). In Nome, ADF&G issued subsistence salmon fishing permits. Together, these two harvest reporting systems documented most of the Norton Sound and Port Clarence areas' subsistence salmon harvests.

However, some subsistence harvests by residents of Nome were not being documented in either system. These included the King Island fishery at Cape Wooley, other Nome families who fished outside the Nome permit area, and Nome families who obtained their subsistence harvests with rods and reels under a sport fishing license rather than a subsistence permit.

This study attempted to documented the total subsistence salmon harvest by residents of Nome by combining subsistence permit and harvest survey data. In this study, researchers estimated that Nome residents harvested 6,138 salmon in 2001 (Figure 4-1). Nome residents reported harvesting 1,837 salmon through the permit system, and 4,078 salmon through surveys administered in this study.

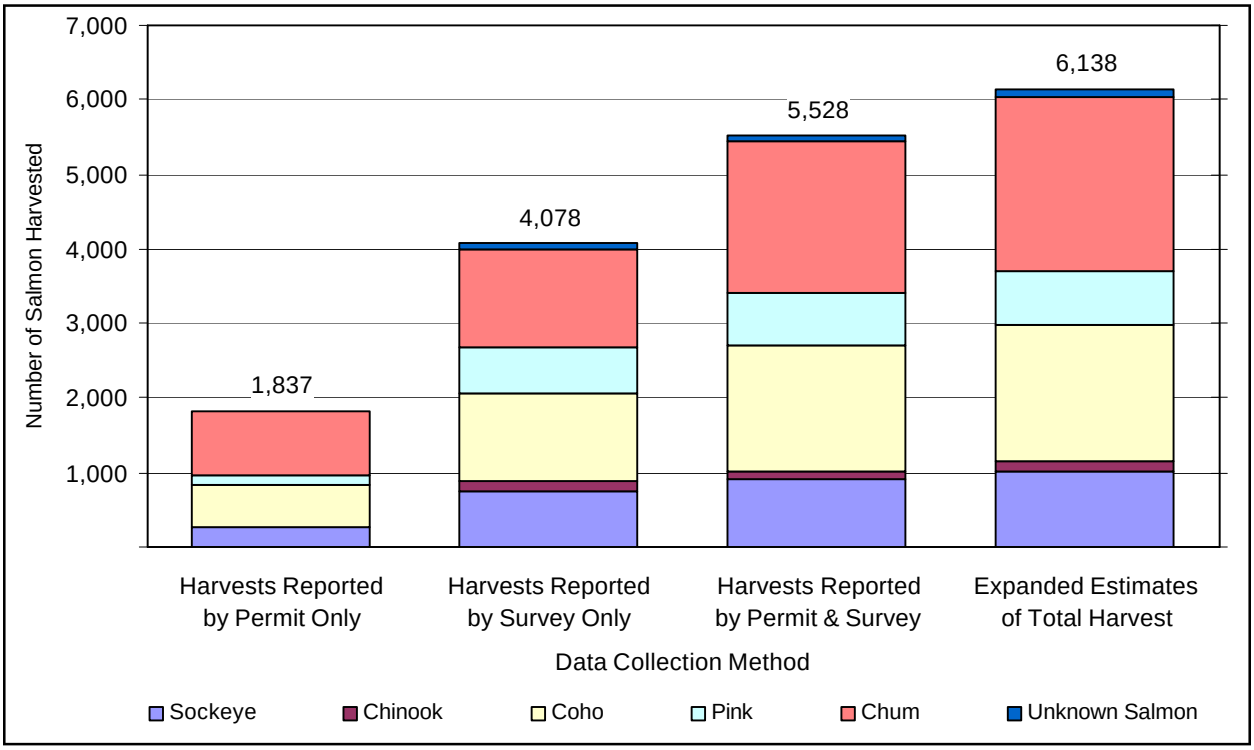

Figure 4-1. Reported and estimated subsistence harvests of salmon by permits and surveys. Permits were intended to document harvests in the Nome permit area, while surveys were intended to document harvests outside the permit area. Permit reports accounted for 33 percent of the reported harvest by Nome households, while survey reports accounted for 74 percent. Twenty nine households reported through both systems.

TABLE 4-1. ESTIMATED SALMON HARVESTS BY AREA AND OTHER VARIABLES

	Nome Permit Area	Port Clarence Area	White Mountain - Golovin Area	Eastern Norton Sound Area	Other Alaska Areas	All Areas
Number of Salmon Harvested, By Species						
Sockeye	477	427	0	0	114	1,018
Chinook	28	14	57	30	0	129
Coho	995	144	584	98	0	1,821
Pink	398	212	129	0	0	739
Chum	1,326	265	666	76	0	2,333
Unknown Salmon	2	96	0	0	0	98
All Salmon	*3,226*	*1,158*	*1,436*	*204*	*114*	*6,138*
Number of Salmon Harvested, By Gear Type						
Nets	2,617	1,084	871	111	86	4,769
Rods and Reels	609	73	565	93	28	1,369
All Gear	*3,226*	*1,158*	*1,436*	*204*	*114*	*6,138*
Number of Salmon Harvested, By Strata						
Permit Households (N=130 HHs)	2,591	0	156	0	0	2,746
King Island Community (N=37 HHs)	0	403	0	0	0	403
Other Nome Households (N=24 HHs)	111	735	789	0	0	1,635
SF License Households (N=117 HHs)	525	20	492	204	114	1,355
All Strata	*3,226*	*1,158*	*1,436*	*204*	*114*	*6,138*

A few households who obtained subsistence permits were later surveyed for this study. Thus, they reported harvests through both systems. After these households were identified to avoid double counting, researchers tabulated a total reported harvest of 5,528 salmon. Expanding for unsurveyed households and unreturned permits brought the total estimated subsistence harvest of salmon by Nome residents in 2001 to 6,138 salmon (Figure 4-1).

This chapter summarizes the findings, beginning with estimates of the total effort and harvests by Nome residents, by area. Then it discusses the harvests of the different samples in the survey project.

Effort and Harvest by Area

In 2001, 104 Nome households returned subsistence salmon permits and 158 Nome households were contacted during the survey project (including 21 households who previously had obtained subsistence permits). Thus, subsistence salmon harvest information was gathered from a total of 233 Nome households (20 percent of Nome's 1,184 occupied households) who provided 294 separate harvest reports (households who fished in more than one area filed multiple reports). Table 4-1 includes a summary of these harvest reports by area, by species, by gear type, and by strata.

Of the 233 total households, 134 households reported catching at least one salmon in 2001. The largest concentration of effort, as would be expected, was in the Nome permit area, where 106 households reported catching salmon. Twenty-nine households caught salmon in the White Mountain-Golovin area, 40 caught salmon in the Port Clarence area, 6 caught salmon in eastern Norton Sound, and 2 caught salmon in

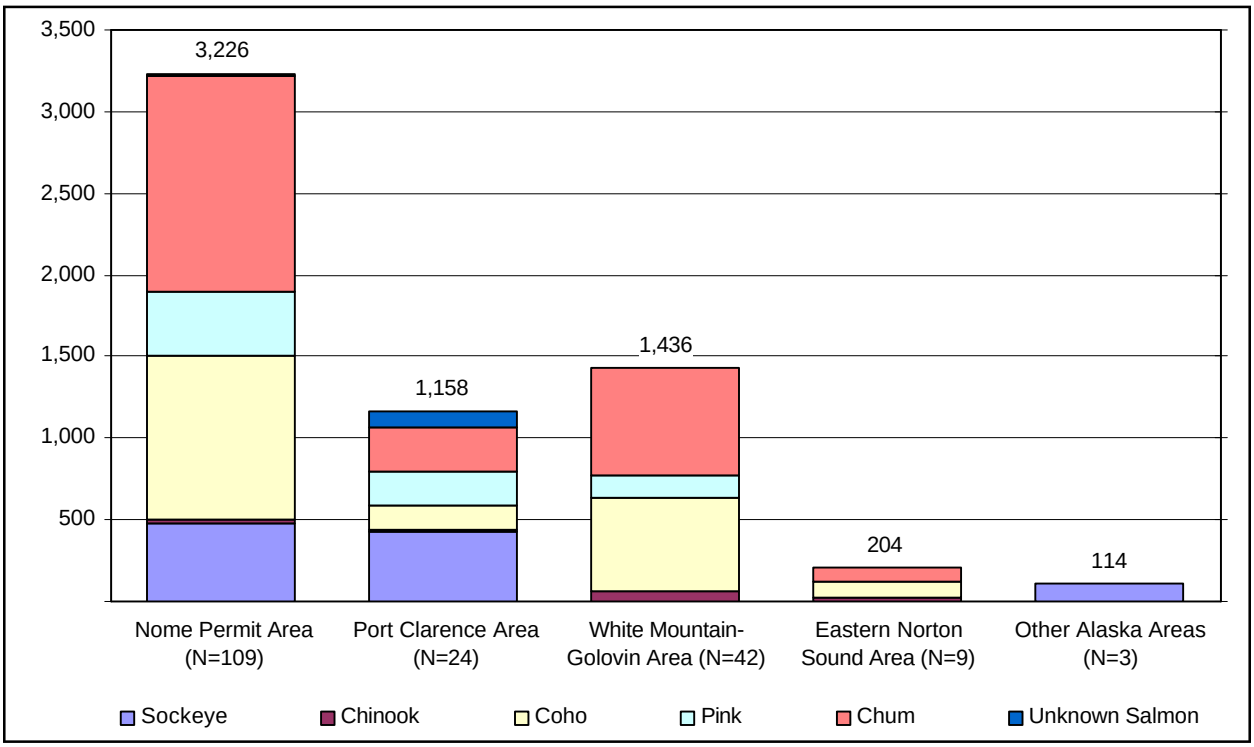

Figure 4-2. Estimated subsistence harvests of salmon by area. Nome residents harvested an estimated 53 percent of their salmon in the Nome permit area, 19 percent in the Port Clarence area, 24 percent in the White Mountain-Golovin area, and about 5 percent in other areas.

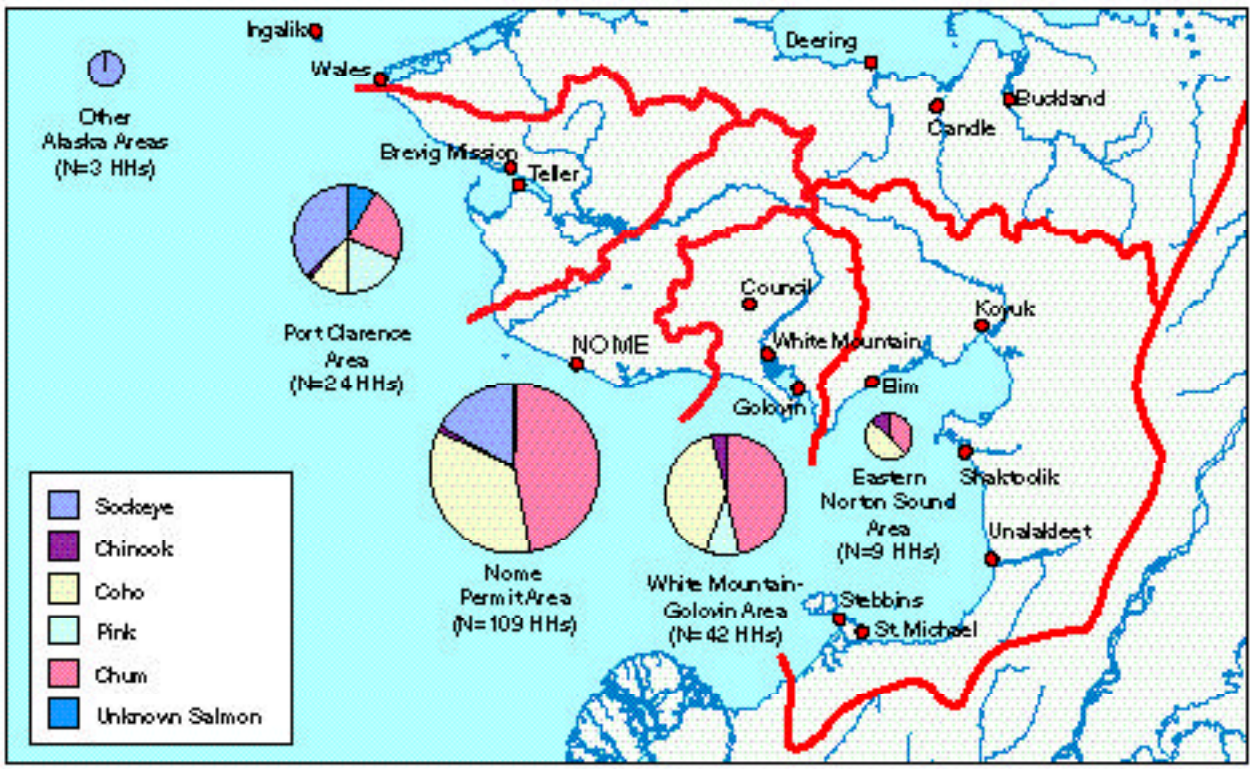

Figure 4-3. Estimated number of salmon caught by area, 2001. These are the same data shown in Figure 4-2, above, displayed over a map of the Norton Sound-Port Clarence Area.

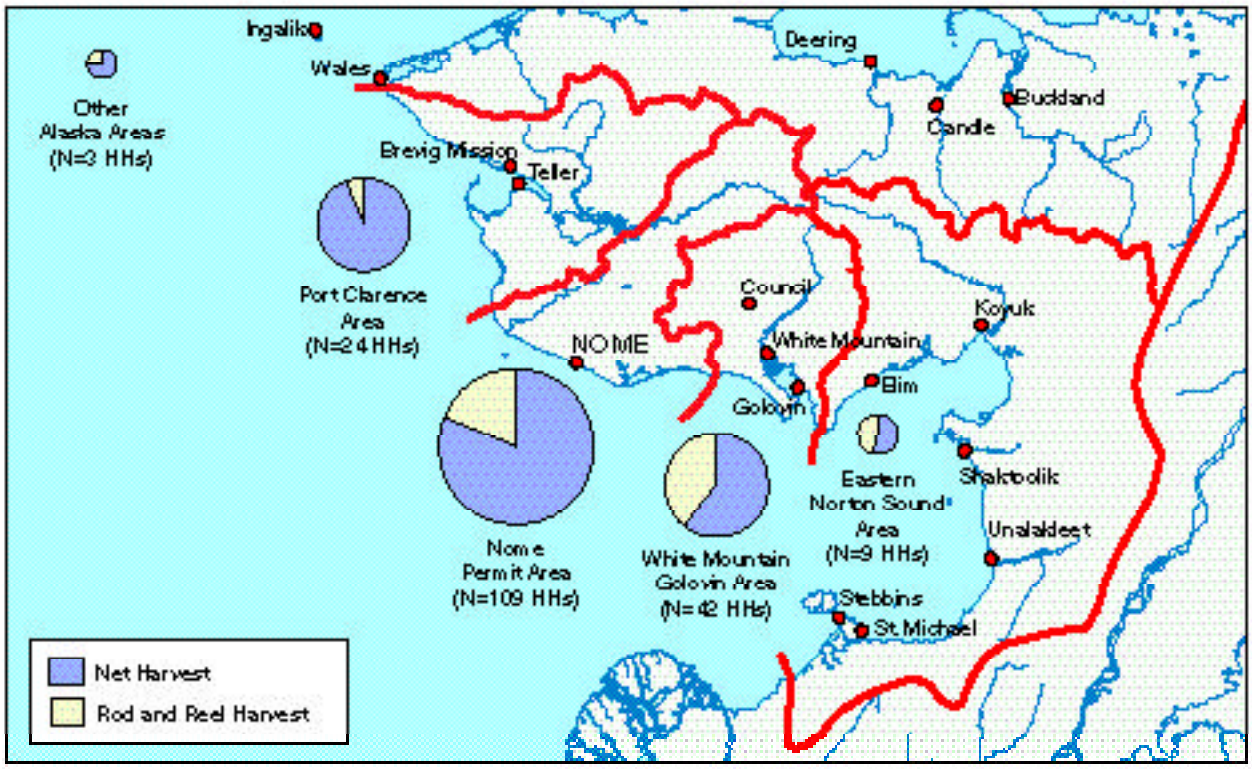

Figure 4-4. Estimated number of salmon caught by gear type by area, 2001. Nets accounted for 78 percent of the total estimated salmon harvest. Reliance on nets was greatest in the Port Clarence area where nets provided 94 percent of the total harvest, compared with 81 percent in the Nome permit area and 61 percent in the White Mountain-Golovin area. Coho salmon accounted for 64 percent of the rod and reel harvest, pink salmon for13 percent.

other areas of Alaska. The survey asked about harvests in the Kotzebue Sound area, the Yukon area, and the St. Lawrence Island area. No surveyed households reported harvesting salmon in any of these three areas.

Thirty-nine Nome households who caught salmon in 2001 harvested all their salmon outside the Nome permit area. Thirteen households reported fishing in two areas, and two households reported fishing in three areas. For households fishing in more than one area, by far the most common pattern was to fish in the Nome permit area and one other area, although one household reported fishing in the Port Clarence and the White Mountain-Golovin areas, but not in the Nome permit area.

The distribution of harvests among the different areas closely followed effort (Figure 4-2, Figure 4-3). In other words, average harvests per household were similar in all three areas.

In 2001, the permit system documented the harvest of 1,837 salmon in the Nome permit area. That represented only 57 percent of this study's estimated total salmon harvest of 3,226 salmon by Nome residents in the Nome permit area. Of the estimated 1,389 salmon not reported in the permit system, 609 (44 percent) were taken with rod and reel, the remainder were unreported net harvests.

This study estimated that Nome residents harvested 1,158 salmon in the Port Clarence area, 1,436 salmon in the White Mountain-Golovin area, 204 salmon in the eastern Norton Sound area, and 114 salmon in other Alaska areas (Figure 4-2). In percentage terms, 47 percent of the estimated harvest by Nome residents was taken outside the Nome permit areas, none of which were required to be reported through the permit system.

In sum, this survey substantially increased documentation of Nome's salmon harvest. The 1,837 salmon reported through the permit system represented only 30 percent of the estimated total

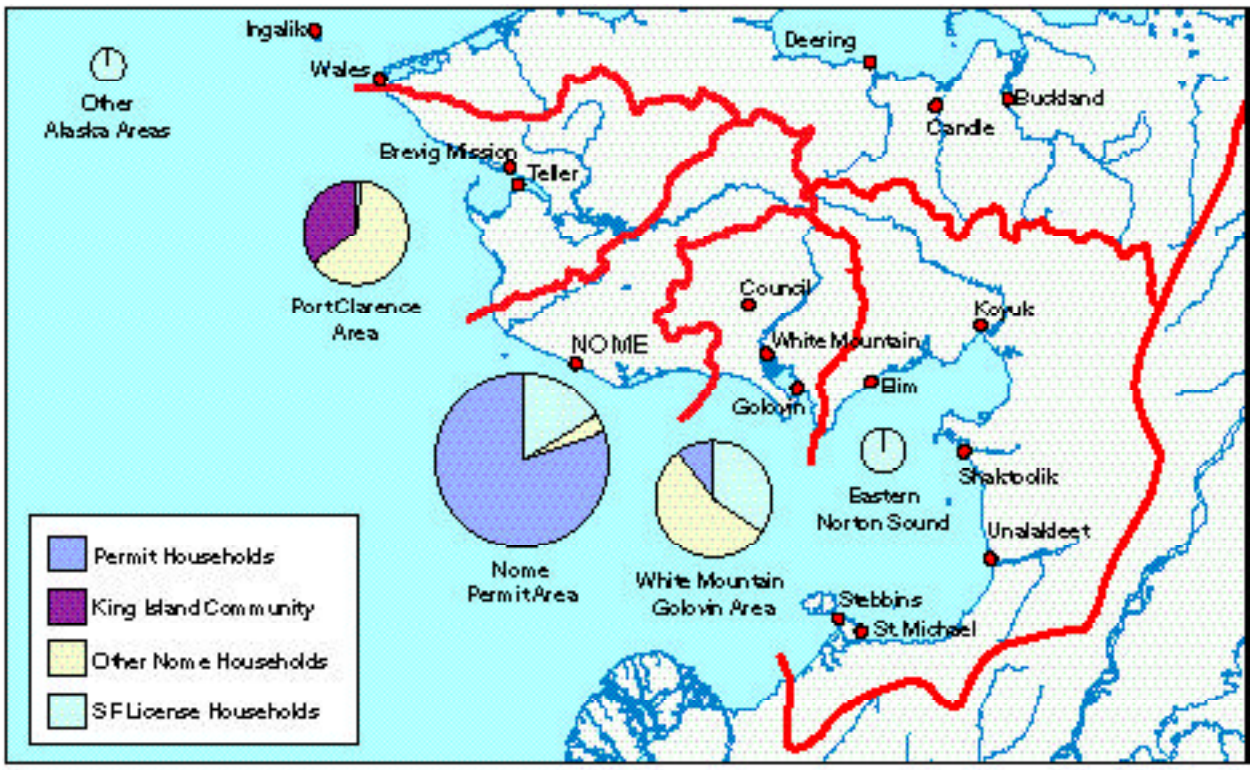

Figure 4-5. Estimated number of salmon caught by sample groups by area, 2001. About 80 percent of the harvest in the Nome subdistrict was taken by households with subsistence salmon permits, most of the rest was taken by households with sport fishing licenses. All King Island households' harvest occurred in the Port Clarence area, primarily at Cape Wooley. Other Nome household accounted for 55 percent of the harvest in the White Mountain-Golovin area.

harvest of 6,138 salmon by Nome residents in all areas.

Figure 4-3 also shows how the composition of harvests varied by area. In the total Nome salmon harvest, chum comprised 38 percent, followed by coho with 30 percent, and sockeye with 17 percent. In the Nome permit and White Mountain-Golovin areas, chum contributed the most, 41 percent and 46 percent respectively. In eastern Norton Sound, coho contributed the largest portion of the harvest, 48 percent. In the Port Clarence area, sockeye harvests (37 percent) exceeded the other species. These differences reflected the local abundance of the different species. Port Clarence was the only area with significant numbers of sockeye.

In Norton Sound, pink salmon runs were much stronger in even-numbered years than in odd-numbered years. In 2001, pink salmon contributed only 10 percent to the total estimated catch. That would be expected to double in an even-numbered year.

Figure 4-4 shows the number of salmon caught in each area, by gear type. Nets accounted for 81 percent of the total harvest in the Nome permit area, 94 percent of the harvest in the Port Clarence area, and 61 percent of the harvest in the White Mountain-Golovin area. A substantial reliance on rods and reels was evident in both the areas east of the Nome permit area. In part, this reflected the targeting of coho salmon, which were readily taken with rod and reel.

Figure 4-5 shows the proportion of the harvest in each area taken by the different strata in the survey, and by the permit households. In the Nome permit area, as would be expected, 96 percent of the harvest was either from permit households (80 percent) or sport fish license households (16 percent). Also as expected, King Island households' harvests occurred in the Port Clarence area, where they comprised 35 percent of the total. Other Nome households accounted for most of the rest (63 percent). The White Mountain-Golovin area showed harvests by all

TABLE 4-1. CHARACTERISTICS OF FISHING BY AREA

	Nome Permit Area	Port Clarence Area	White Mountain - Golovin Area	Eastern Norton Sound Area	Other Alaska Areas	All Areas
Participation in Subsistence Fishing						
Usually Fish?	87	24	38	9	2	160
Catch Salmon This Year?	77	23	35	8	3	146
N of Households Responding	*87*	*24*	*38*	*9*	*3*	*161*
Years Fishing in this Area						
Minimum	1	1	1	2	1	1
Maximum	69	47	55	30	5	69
Mean	23.5	17.6	23.1	18.0	3.0	22.1
Median	20	20	25	20	3	20
N of HHs Responding	*81*	*22*	*36*	*4*	*2*	*145*
Frequency of Fishing in this Area						
Rarely	4	2	2			8
Some Years	5	2				7
Most Years	7	4	4			15
Every Year	66	15	30	5	2	118
N of Households Responding	*82*	*23*	*36*	*5*	*2*	*148*
Reason For Fishing In This Area						
Traditional Area	43	19	11	4	1	78
Accessible Area	54	15	19	2	1	91
Abundant Salmon	13	10	15		3	41
Have Camp or Cabin	4	1	7			12
Other Reason	1		2			3
N of HHs Responding	*80*	*23*	*36*	*5*	*3*	*147*
Type of Transportation Used To Access This Area						
Car or Truck	77	21	33	1	3	135
Airplane	1	0	1	4	2	8
Boat	30	9	27	5	1	72
Four-Wheeler	8	1	2	0	0	11
Snow Machine	0	1	0	0	0	1
Foot	1	0	2	0	0	3
N of HHs Responding	*79*	*23*	*36*	*5*	*3*	*146*
Type of Fishing Gear Used						
Set Net	18	20	6	0		44
Drift Net					1	1
Seine	6	1	3			10
Rod and Reel	73	5	32	6	1	117
N of HHs Responding	*80*	*23*	*36*	*6*	*2*	*147*

samples except King Island. Other Nome households accounted for 55 percent, sport fish license households accounted for 34 percent, and permit households accounted for 11 percent of the total harvest in the White Mountain-Golovin Area.

Household Fishing Histories

The survey included a number of questions that asked about households' fishing histories. The questions were asked separately about each area fished (Appendix 1). Table 4-1 summarizes the responses to these questions, by area. These questions were not asked of households who only obtained permits.

When asked how many years they had fished in each area, households' responses ranged from 1 to 69 years, with an average tenure of 22 years. Tenure was greatest in the Nome permit area, 23.5 years, but almost as great in the White Mountain-Golovin area 23.1 years, and not that much less in the Port Clarence area, 17.6 years. When asked how frequently they had fished in each area during the last decade, 80 percent of the households reported fishing in the area every year, and an additional 10 percent reported fishing in most years (Table 4-2).

The responses to these two questions were at odds with perceptions that Nome households were increasing their efforts outside the Nome permit area. The surveyed households, at least, reported almost continuous fishing in both the Port Clarence area and the White Mountain-Golovin area over the last decade. The answers suggested that Nome residents' fishing has become more visible, either because they were fishing more often, in more visible locations, with different gear (nets as opposed to rods and reels), or harvesting more salmon outside the Nome permit area.

The most common reason given for fishing in each area was access, cited by 62 percent of the households, followed by "traditional area" by 53 percent of the households, and "abundant salmon" by 28 percent of the respondents. Relatively few households reported a camp or a cabin as the reason for fishing in a particular area, except in the White Mountain-Golovin area. Most of these probably were in Council, an old mining community accessible by road from Nome.

The significance of the state road system was evident in the responses to the question about how households accessed the different areas to fish for subsistence. While only 49 percent used boats to access their fishing areas, 92 percent used cars or trucks.

5
Findings: Teller and White Mountain

In 2001, Nome residents harvested almost half their salmon outside the Nome permit area. Of the estimated 6,138 salmon harvested by sampled households, 1,158 salmon (19 percent) came from the Port Clarence area, and 1,426 salmon (23 percent) came from the White Mountain-Golovin area.

Residents of the smaller communities in these areas have become concerned about the effects of increased harvests of local salmon stocks, and about competition for fishing sites. To explore these concerns, researchers in this study interviewed key respondents in both Teller and White Mountain, and held a community meeting in White Mountain. Harvest data for Teller and White Mountain were collected in a separate project, and are summarized in Chapter 3.

This chapter summarizes the results of the community meeting and interviews. The summaries begin with descriptions of the respondents and the local fishery, then summarizes their assessments of the impacts of Nome residents' fishing on the Teller and White Mountain fisheries.

Teller

The Teller respondents included nine people in five households. These included heads of three households who had lived in Teller all their lives except short periods away for work or education, an elder couple who moved to Teller from a neighboring community in the 1950s and had lived there ever since, and one couple in which the man had lived in Teller less than ten years. Two respondents were interviewed in the IRA office, the remaining seven were interviewed in their homes.

All but one of the respondent households was actively involved in salmon fishing in 2001. The non-fishing respondent did not fish in 2001 because of a health problem, but he did help his parents fish, and he had been an active fisher in the past.

One respondent reported fishing salmon from his family camp on the north side of Grantley Harbor. All the remaining respondents reported setting salmon nets off the beach in front of Teller on the south side of Grantely Harbor. They used set gill nets, with 4.5-inch to 5.25-inch mesh, ranging from 75 to 150 feet long.

"We put out short nets, or nets with a pocket in it," said one respondent.

"A hundred fifty feet is a long net here," said another.

Respondents in one household helped researchers map family net sites on the Teller beach. Families with houses on the beach usually set nets in front of their houses. There was not room along the beach for everyone to set at once, so neighbors took turns setting their nets, sometimes coordinating their sets with telephone calls. Several respondents described cooperative fishing arrangements with other households. Figure 5-1 summarizes a typical arrangement of nets described by respondents, showing both nets set by Teller families and nets set by Nome families off the beach in front of Teller.

"In this area," one man said, "if one or the other of us has their net out drying, then one of the other of us will put their net in." Another respondent reported sharing a single 150-foot net with two other households.

The short nets and the cooperative approach to fishing allowed a maximum number of families to fish along the congested beach in front of Teller. Still, two respondents reported conflicts with other Teller families over net sites.

One respondent reported a fellow resident who "had the guts to tell me that he was fishing out in front of the old house for so many years, and

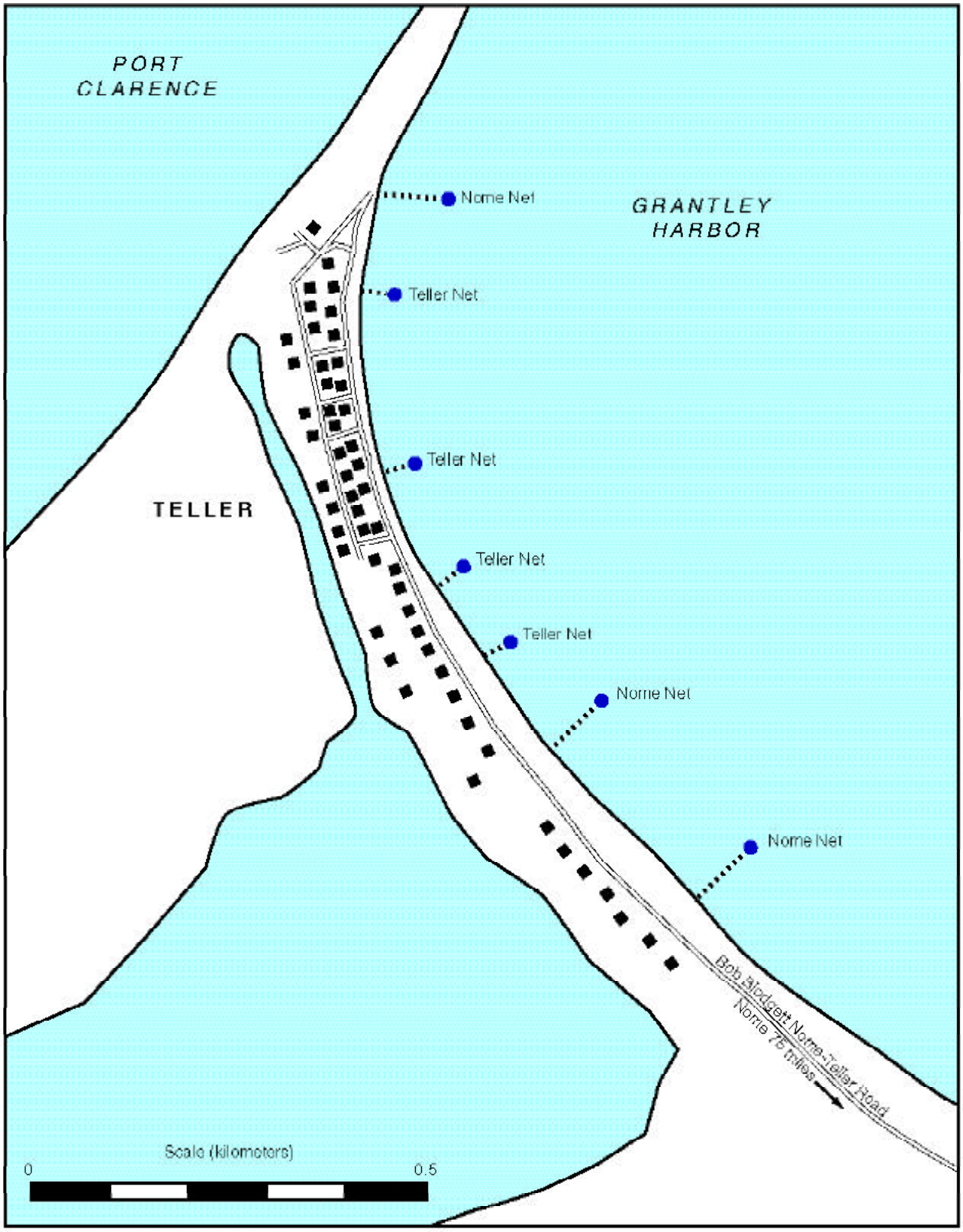

Figure 5-1. Net sites at Teller.

he never did. He tried to take over our fishing site. We used it, but right there (they) came and said that was their fishing area. They wanted to take our scow and our anchors and our cutting tables." The respondent maintained use of the site and the other resident eventually moved out of Teller.

Teller respondents differed in their assessment of the 2002 salmon runs in the Port Clarence area. "The run's down," one respondent said. "Usually our freezer is completely full by now, and the other one is half full, and we leave room for a moose. This year, we could put three moose in. This year, everything was down. They say there's lots of fish on Agiapuk River, but we haven't gone up there."

But another resident reported, "We had a good run this year, 10 to 20 fish a net. A lot of it depends on how many fish people want, too."

Several respondents agreed that in a good year, one could expect to catch 100 to 125 fish a day at the height of the run. Regardless of run strength, weather during the summer of 2002 was ideal for drying salmon, cool and windy but not wet.

Every Teller respondent reported that the number of Nome residents fishing in the Teller vicinity had increased in recent years. Researchers asked one respondent if Nome residents came to Teller when he was young. "No. There was no road," he observed. "People went from community to community in skin boats. But they weren't here for fish. They came here for berries and stuff. They were from Wales mostly, Diomede, Shishmaref, even Kotzebue. The only Nome traffic we got was people going up North, and the tug boat."

The Teller road was completed in 19??. Fishing was good in the Nome in the 1970s; both commercial and subsistence salmon fisheries in the Nome area were reporting record harvests. Asked when he first observed Nome residents fishing in the Teller area, one respondent said, "That's hard to say, because we have some people who relocated from here to Nome. They have camps up Tuksruk channel and farther up. If they're not staying on land that their parents or grandparents used, it's near to it. They'd be neighbors or something like that."

Several Teller respondents said they first observed significant fishing effort by unrelated Nome residents in the early 1990s, which coincided with the beginning of extensive subsistence fishing closures in the Nome area.

"Occasionally you'd see someone (from Nome)," said one respondent. "Everybody has family here. But in the last 10 years, since Nome closed, we hadn't seen anything like that before."

One respondent thought that Nome residents' effort in Teller depended on what was going on in Nome. "If they close the ocean in Nome," he said, "then people start showing up here. Some of the time, if they're not running down there very good, they'll come up here. But usually, it's when that area is closed down there. You see the same thing happening on the Fish River."

Another attractive feature of the Teller fishery for Nome residents is the presence of sockeye salmon ("reds"), which are uncommon in the Nome Subdistrict. One respondent observed that usually he began seeing Nome residents "after the Fourth of July. They hit the red run. They hit right after the Fourth of July, for about two weeks… Everybody wants reds."

The exact number of Nome residents who began fishing in Teller is unknown, but it was not a large number. Several respondents agreed that at most, they would see four or five Nome nets set off the beach at Teller at any one time, along with a similar number of nets belonging to Teller families.

The Nome residents usually stay "only a couple days… Most of the time they catch their fish, put them in totes, bring them to Nome." Occasionally a Nome resident would set up a drying rack on the beach, or cut and salt fish. But the most commonly observed practice was to return to Nome with fish in the round.

Nome residents apparently were good about tending their nets. Most stayed in Teller until they were done fishing. "There were some people who leave their nets, and go to Nome," one respondent said. "They come set their net in the morning, then go back to Nome, and then come back in the evening to check it."

There was only one net-tending problem reported. "(A Nome man) left a real long net out

there, and never came around for a whole week. Everybody bitched like hell."

"If it's really windy, or if they don't come back," one Teller respondent said, "I'll untie their net from shore and let it drift out, attached to the anchor. I do that to local people sometimes, too. If people set a net, go to Nome, and don't come back, I'll untie their net, too."

For the most part, the same group of Nome residents returned each year. Those with family in Teller blended in, often fishing upriver in family fish camps, out of sight and out of mind. But others set their nets right off the beach in Teller, and conflicts developed between the Nome and Teller fishers. From Teller's perspective, the biggest problem by far was the length of Nome residents' nets.

When researchers arrived for one interview, the respondent didn't even wait for a question. He began with a statement. "The problem we have is those big nets. A shackle. They fish everything, and there's no escapement."

His comment was echoed by another respondent. "The amount of gear being set…was alarming, the length of the nets. Nobody around here had that kind of gear."

Teller residents described going out to tend their 100-foot or 150-foot net, and finding 300-foot nets set on either side. "Some people have been offended. 'That guy is corking me off. He set a 300-foot net in front of me, and I'm not catching anything now.' A lot of (Nome) people set right in front of the village (Teller). That's the easiest place to fish with a truck."

"The amount of gear was the first thing that raised anybody's hackles," one Teller man said. "It's as if it set a standard. If you want to catch any fish, you have to set 300 feet. If we all go to that size of gear, how much do we need? It's' getting to be a competitive deal all the way around. It's not looking good."

Several Teller families, this respondent reported, have purchased longer gear for themselves, to better compete with the Nome residents. One Nome resident was advertising his 300-foot net for sale in the Teller Native Store in August, 2002.

"Now some local people are fishing long nets. I sure don't like to see that. They don't realize that getting a longer net to catch the fish they used to catch isn't helping matters. I think if we got together, and when fish start declining, we'd shorten our nets, so that we can have some escapement… There's nothing wrong with them coming up here and fishing, as long as they look at what people here are doing."

Several respondents thought the Board of Fisheries should limit net lengths in the vicinity of Teller to no more than 150 feet.

A second issue in Teller involved customary trade, that is, the exchange of subsistence-caught food for cash. Under state regulations, the sale of any subsistence caught fish is prohibited unless the sale occurs in a recognized customary trade fishery. The state has not established a customary trade fishery in the Port Clarence area. But customary trade in fish is allowed under federal regulations. So fish caught in federally-managed waters in the Port Clarence area could be sold legally; fish caught in state-managed waters could not.

Several families in Teller and nearby Brevig Mission reportedly were involved in customary trade in dried salmon. Teller respondents also believed that one Teller resident and several of the Nome residents fishing in the Teller area were selling fresh, unprocessed salmon for cash.

"I get calls almost every week," said one respondent, "from individuals who want to know who's selling dry fish up here. People from Anchorage come to Nome, and want to get dry fish. They can't get any in Nome, so they'll call up here. I'll give them phone numbers, mostly people in Brevig Mission. We used to sell them to Blodgett's store. (Demand) has increased. Before was it through the store they were purchasing. Now it's (from) individuals."

"On this side (Teller), there are only two or three families at this time. But if you go to the Brevig Mission side, you have more, five or six families are selling dry fish. Sometimes it might be as many as ten families."

Demand is certainly present. "Fish have become more of a commodity here," another respondent said. "There are days when I'm checking the net and I've had people come up and ask to buy salmon from the net. It's an

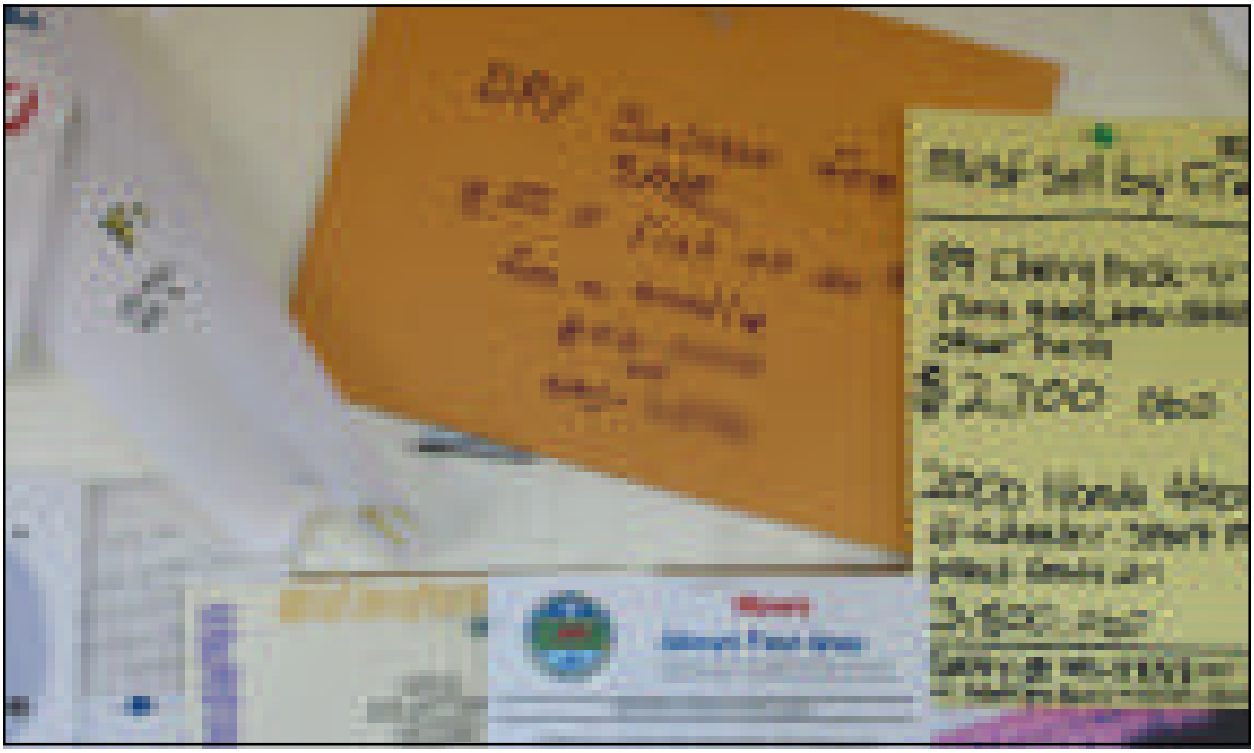

Figure 5-2. Customary Trade in Salmon. A hand-printed flyer on a bulletin board in a Nome grocery store advertises dried salmon for sale, and lists Teller and Nome phone numbers. Customary trade (meaning the exchange of subsistence-caught fish for cash) is legal under federal regulations, but prohibited by state regulations.

awkward situation. You don't really want to sell any, and you don't want to give that many away."

A third respondent described a Teller resident allegedly "coming back with totes full of fish, selling them on the beach. His biggest buyers were people from Norton Sound Hospital."

Respondents seemed more tolerant of customary trade in dried fish, and less tolerant of customary trade in fresh fish. "People who are coming up here to fish for sale, that's not right," said one respondent. "They say they're subsistence fishing, but they're not."

White Mountain

White Mountain respondents included 17 people. Sixteen respondents provided comments during a community meeting to discuss fishing issues. Three respondents (two of whom had attended the meeting) were interviewed the day after the meeting by Sandra Tahbone and Austin Ahmasuk.

Most respondents were active in subsistence fishing in the White Mountain-Golovin area (one respondent did not fish herself). One of the respondents also was involved in a family sport fish guiding business based in White Mountain.

Respondents ranged in age from …

They described a subsistence fishery that concentrated on the harvest of pink and chum salmon for drying (survey data show the average harvest in White Mountain and Golovin to be 90 percent pink and chum). The rest of the salmon harvest is primarily coho and a small number of chinook, which are eat fresh or frozen.

Beach seines were the most frequently mentioned type of gear, but set gill nets and rods and reels also are used. Several respondents mentioned switching from propeller-driven outboard motors to outboard jets, which are better able to travel in shallow water and thus open up new areas to fishing.

Older respondents recalled much larger harvests when they were younger. "When we were growing up," she recalled, "we had a three-tier fish rack. We would fill it almost every

weekend and put away in our cache. Now we just fill up one tier."

"I used to put away six to eight hundred fish away for our family and for bargaining," said another respondent. "Now it's harder to get fish, so I probably put away enough to get by. Maybe half of that."

All three interviewed respondents said fish were less abundant now than in the past, and during the meeting several other people agreed. While not as severe as the declines in the Nome area, the declines in the Fish River system have resulted in closures for commercial, sport, and subsistence fishing during the last decade. The subsistence closure in ___ is believed to have been the first ever subsistence salmon fishing closure in the White Mountain-Golovin area.

Some respondents suggested the decline was related to commercial fishing in other parts of Alaska; one respondent complained the commercial fishing in Golovnin Bay adversely affected salmon abundance in the Fish River system. Several respondents also mentioned increases in beaver and brown bear populations.

Half the respondents mentioned concerns about beaver dams. "When I was little," one respondent recalled, "I never saw a beaver dam. The closest was a muskrat. I was a teenager the first time I saw a beaver, and actually ate beaver. Now we have beavers in every creek. They are blocking off some areas of the river… People have tried to kill off the beavers, but there is only so much you can take.

"I've never seen so many beavers dams, in every creek and slough. There is one across from our camp. We've been trying to get rid of it. We brought this up with Fish and Game. They said that when beavers build dams, they make a place for fish to spawn right below. But the dams that I see are too shallow and freeze below the dams.

"If you go up the Council river, there's a place called Ophir, with a huge huge dam. Right below it, there are hundreds of silvers trying to get past it. A couple people from Council tried to tear it down, and the beavers built it right back up."

Brown bear populations also have increased, which some respondents thought was related to the arrival of moose in the Fish River area about 50 years ago. "When I was twenty years old, I only saw one bear," said one respondent. "Now we see a lot of them… One day we saw seven bears, two of which were cubs. Everyday we see tracks." Biologists believe bear predation has depressed the moose population in the area; local people feel bears have depressed the salmon stocks as well.

Along with the decline in stocks, there also was a decline in fishing effort by local residents, several respondents asserted. One respondent, who juggles subsistence fishing with the demands of a summer job described her personal fishing history:

> I started fishing with my grandparents at a place called *Niialupaq*. There is a cabin with a couple tents there. I probably started in the early '60s. There were a couple families that fished there. When we were there, we fished for our food source as well as for dog food. We spent the entire summer there. There were a couple fish racks for each family that lived there.
>
> Today, I put fish away for my family and my grandpa. I also put some fish away to trade for muktuk and walrus. We try to get enough fish so we can have enough native foods. This year, I probably put away maybe three or four hundred pinks, more than last year. I used to smoke silvers but I haven't for a couple years due to low silver runs. It's not as good as before. Sometimes, I don't have time for that either.

The decline in abundance, harvests, and effort also have resulted in a decline in sharing, some respondents believed. People have fewer fish for themselves, and thus fewer fish to share.

Against this background of declining abundance and declining harvests, White Mountain respondents also began seeing an increase in the number of Nome residents fishing in the White Mountain-Golovin area, which they dated to the late 1980s and early 1990s. The growth of the seasonal community at Council has contributed to Nome's effort in the Fish River system.

"Council is getting to be pretty crazy," one respondent said. "Cars everywhere, boats everywhere."

"When I was little," said another respondent, "the only (non-local) boat I would see was old man Holly. He was the only one who would come down. Maybe it's been ten to twelve years, and it seemed to increase every year after that. In the beginning, it used to be locals, now with more houses in Council, there have been more and more Nome boats."

Because the Niukluk River was too shallow most of the season to navigate with a propeller-driven boat, most Nome residents used outboard jet boats. In 2002, the water was so low below Council that it was hard to access the Fish River, even with jet boats. "This year we were blessed with low water so we didn't see too many boats," said one person in White Mountain. Respondents also observed Nome boats increasing in size over time, and a shift towards flat-bottom boats that worked better with outboard jets.

Nome residents targeted different species and relied more heavily on rod and reel gear in the White Mountain-Golovin area than in the Port Clarence area. Earlier in the season some Nome residents come to the Fish River to harvest chums and pinks. Others targeted the chinook (king) run. Later in the season, from end of July into August, Nome residents came for coho (silver) salmon. "People that come earlier are more than likely doing their subsistence fishing," said a White Mountain respondent. "More and more come down for sports fishing. We saw a couple new outfits from Nome that are bringing clients to fish."

"I think they are targeting silvers and kings," said another respondent. "I don't usually fish for kings but I notice when the kings are running I see a lot more people."

Nome boats tended to make day trips down river to fish, returning back upriver to Council in the evening. Some boats made multiple trips down and up the Niukluk River, which some respondents thought was a way to circumvent sport fishing limits.

"They will catch their limit and come back down," the respondent said. "When there wasn't a limit you would see two people in a boat; nowadays the boats are packed. They bring their kids to count for taking a limit, which is three more fish you can take."

The most common impact (mentioned by six respondents) of Nome residents' fishing was competition for fishing sites between local residents using beach seines and the Nome residents using rods and reels.

"You want to seine once," said one respondent. "Then you catch what you need for the day. There are only so many spots, and usually there are boats there already, like three or four boats. I don't know if they are just sports fishing or subsistence fishing, I don't want to go out and seine in front of them. I don't know if I could do that legally, if they're just sports fishing and I'm subsistence fishing. I'm seeing more and more of that."

"One of our ladies talked about going down to the holes to subsistence seine where the chums would be," said one respondent, "before the Nome boats get there. Otherwise we wouldn't be able to seine. Otherwise we will have to find another spot. We don't want to be mean and fish in their spot."

The competition between Nome and White Mountain residents was not limited to simply subsistence fishing. One family in White Mountain operates a sport fishing guide business from their camp. They also were affected by competition from Nome residents. "When we first started off our fishing business," said one of the owners, "we never had to fight for any areas or sites. Nowadays, it's gotten so we have to start earlier and earlier. The Nome boats are showing up as early as 5:00 am.

"There are maybe four good holes and maybe up to ten holes that we use. You have to get there before someone else does. Some of those boats will be sitting in a hole and will cap you, they'll go a hundred yards below, throw their anchor out. When they do that to our guides, we told them just to leave."

The Fish River system was also a popular destination for Nome moose hunters, despite recent restrictions in seasons and bag limits in the White Mountain-Golovin area.

"We are seeing more hunters because people know our river," said one respondent. "This year

because of low moose (populations) in our area, we could only take so many moose. We had so many different boats in our area hunting moose, and we were only given so many to catch. It was a scramble, combat hunting. There were people leaving early and coming home late to try to bag a moose.

"It used to be, a whole season, people would leave at dusk, go hunting, and come back before it gets dark, because that is when the moose come out. Now it's an all day thing. You have to get out before other people show up. When we did our hunting, we would bump into different boats that weren't from our area."

One resident suggested that ADF&G should monitor boat traffic in and out of Council. A frequent complaint was the location of the salmon counting tower, which was on the Niukluk. Several respondents suggested it should be moved onto the lower Fish River, so it could count all the salmon entering the Fish River system.

Many respondents were concerned about the future. "We don't have problems like Nome," said one. "I don't want to see it come down to that. I could see it; I wouldn't like it. I don't see it changing too drastically. Maybe because we still have fish – I don't want to lose our fish."

6
Discussion

This study provided a more complete estimate of Nome residents' subsistence salmon harvest than has existed previously. In the Nome permit area in 2001, the subsistence permit system reported 1,837 salmon harvested, while this study estimated 3,226 salmon, a difference of 1,389 salmon. Outside the Nome permit area, this study estimated that Nome residents harvested an additional 2,912 salmon, for a total harvest of 6,138 salmon. Thus the subsistence permit system accounted for at most 30 percent of Nome's total subsistence salmon harvest in 2001.

This study estimated that Nome residents took 1,436 salmon in the White Mountain-Golovin area, compared with an annual average of only 170 salmon reported through the permit system. This study also estimated that Nome residents took 1,158 salmon in the Port Clarence area, compared with an annual average of only 150 salmon reported through the permit system.

Most of this unreported harvest was legally taken, but was not required to be reported. Either it occurred outside the area in which permits were required or it was harvested with rods and reels by people holding sport fish licenses.

Harvest reports and key respondent interviews indicated that Nome residents fishing in the Port Clarence area used nets and targeted sockeye salmon. Sockeye comprised 37 percent of Nome residents' harvests in this area, while sockeye comprised 29 percent of Port Clarence area residents' harvests.

In contrast, the data suggested that Nome residents fishing in the White Mountain-Golovin Area used rods and reels for about a third of their harvest, and they targeted coho salmon. Coho comprised 41 percent of Nome residents' harvests in this area, but only about 9 percent of White Mountain's and Golovin's harvests.

Although Nome residents reported they had been fishing in the areas adjacent to Nome for an average of 22 years, residents of the adjacent areas perceived a substantial increase in effort and harvests since about 1990, which they attributed to increasing regulation of Nome subdistrict fisheries. These two findings were not necessarily inconsistent, as the survey did not ask Nome residents about past levels of effort and harvest. It was possible that Nome residents may have occasionally harvested small amounts of salmon in adjacent areas in the past, then increased their effort and harvest in recent years and become more visible.

Nome was ten times as large as most of its neighbors, and located in an area of relatively small rivers and modest salmon runs. By comparison, most other communities in northwest Alaska were relatively small (average population 350) and most were located on or near rivers with substantial salmon runs (e.g. Fish River, Koyuk River, Shaktoolik River, Unalakleet River).

Fishery managers responded to these differences by adopting different subsistence salmon regulations in different areas. In most of Norton Sound, there were no closed waters, no closed periods, and no harvest limits for subsistence salmon. In the Nome subdistrict, there were areas of closed waters in all the major streams, closed periods every week, fishing permits with harvest limits, and the state's only Tier II salmon fishery.

While some families were discouraged from fishing by declining abundance and restrictive regulations, as shown by declining salmon fishing effort and harvests in the Nome subdistrict since the mid 1980s, other families appear to have adapted to the restrictions by

increasing their effort and harvests in adjacent areas.

Among respondents in Teller and White Mountain, competition for fish sites was the most common complaint. Some Teller residents thought that limiting gill net lengths to 150 feet in the Port Clarence area would alleviate much of the conflict there, basically forcing everyone to use similar gear. In the White Mountain-Golovin area, Nome residents were more likely to use rods and reels while local residents used beach seines, so a solution to the conflicts was more elusive. In both areas, though, being a good neighbor clearly would go a long way to reducing conflict.

Residents of adjacent areas were very aware of the restrictions placed on salmon fishing in Nome, and some worried that similar restrictions would follow Nome residents into other areas. Because the state legally cannot provide a subsistence priority on the basis of proximity to the resources, Nome residents had as much opportunity to harvest salmon for subsistence in the state-managed portions of the Fish or Kuzitrin rivers as they had in the Nome River. Or as one White Mountain resident said, "The U.S. is a free country, so you can't go around telling people not to fish."

One White Mountain resident commented, "To me salmon means a lot. I do it every year, I've done it since I was young. I can't imagine thinking someday I might have to buy fish to eat. I depend on this resource. I supply my grandpa with his fish. I can't see us not doing this, I want to have fish, I want my grandchildren to have fish to eat. It's a big part of my life."

The Federal Subsistence Board does have more flexibility under law. Customary and traditional use determinations could be used to limit the areas in which Nome residents fished. However, Nome residents already have built a record of using salmon from the Port Clarence area and the White Mountain-Golovin area. The Federal Subsistence Board also is in the midst of a review of its "rural" definition. Although Nome is named as a "rural" community in the Alaska National Interest Lands Conservation Act, that designation could change at some point in the future.

The situation as a whole provided a good case example of the challenges of managing for subsistence for a regional center. Although this study focused on salmon, similar studies could have examined patterns of moose hunting or musk oxen hunting around Nome. Because this study collected and analyzed data for only one year, it was not clear how harvests by Nome residents may have varied over time in the adjacent areas. Even so, the study provided managers with a much more complete summary of Nome's harvest.

References

Alaska Department of Administration
1985 *Alaska Geographic Differential Study*.

Alaska Department of Fish and Game
1993 *Community Profile Database*. Division of Subsistence. Juneau.

Alaska Department of Labor
1986 *Alaska Planning Information.* Juneau.

1990 *Alaska Population Overview: 1988 and Provisional 1989 Estimates.* Juneau.

1993 *Alaska Population Overview: 1991 Estimates.* Juneau.

Anderson, Douglas D.
1984 Prehistory of North Alaska. IN *Handbook of North American Indians: Arctic.* David Damas, vol. ed., William C. Sturtevant, gen. ed. Smithsonian Institution. Washington, D.C. pp. 80-93.

Bockstoce, John
1979 *The Archeology of Cape Nome, Alaska.* The University Museum. University of Pennsylvania. Philadelphia.

Burch, Ernest S., Jr.
1980 Traditional Eskimo Societies in Northwest Alaska. IN *Alaska Native Culture and History.* Y. Kotani and W.B. Workman (eds). National Museum of Ethnology, Senri Ethnological Series 4. Osaka, Japan.

1984 Kotzebue Sound Eskimo. IN *Handbook of North American Indians: Arctic.* David Damas, vol. ed., William C. Sturtevant, gen. ed. Smithsonian Institution. Washington, D.C. pp. 303-319.

Cole, Terrence
1984 *Nome: City of the Golden Beaches*. Alaska Geographic 11(1).

Collier, Arthur J. and Frank L. Hess, Phillip S. Smith, and Alfred H. Brooks.
1908 *The Gold Placers of parts of Seward Peninsula, Alaska.* Washington, D.C.: United States Geological Survey Bulletin No. 328.

Conger, Annie Olanna, and James Magdanz
1990 *The Harvest of Fish and Wildlife in Three Alaska Communities: Brevig Mission, Golovin, and Shishmaref.* Division of Subsistence, Alaska Department of Fish and Game. Technical Paper 188. Juneau.

Georgette, Susan, David Caylor, and Sandra Tahbone
2002 *Subsistence Salmon Harvest Summary Northwest Alaska, 2001*. Division of Subsistence, Alaska Department of Fish and Game. Juneau.

Georgette, Susan and Hannah B. Loon
1990 *Subsistence and Sport Fishing of Sheefish on the Upper Kobuk River, Alaska.* Division of Subsistence, Alaska Department of Fish and Game. Technical Paper 175. Juneau.

1993 *Subsistence Use of Fish and Wildlife in Kotzebue, a Northwest Alaska Regional Center.* Division of Subsistence, Alaska Department of Fish and Game. Technical Paper 167. Juneau.

Howe, Allen L., Gary Fidler, Allen E. Bingham, and Michael J. Mills
1996 *Harvest, Catch, and Participation in Alaska Sport Fisheries during 1995.* Division of Sport Fish, Alaska Department of Fish and Game. Fishery Data Series No. 96-32.

Koutsky, Kathryn
1981a *Early Days on Norton Sound and Bering Strait: An Overview of Historic Sites in the BSNC Region. Volume III: The Port Clarence and Kawerak Areas.* Anthropology and Historic Preservation, Cooperative Park Studies Unit, University of Alaska, Fairbanks.

1981b *Early Days on Norton Sound and Bering Strait: An Overview of Historic Sites in the BSNC Region. Volume IV: The Nome, Fish River, and Golovin Areas.* Anthropology and Historic Preservation, Cooperative Park Studies Unit, University of Alaska, Fairbanks.

Lean, Charles F., Frederick J. Bue, and Tracy L. Lingnau
1995 *Annual Management Report 1993: Norton Sound, Port Clarence, Kotzebue.* Division of Commercial Fisheries Management and Development, Alaska Department of Fish and Game. Regional Informational Report No. 3A95-06. Anchorage.

Magdanz, James
1992 *Subsistence Salmon Fishing by Permit in the Nome Subdistrict and Portions of the Port Clarence District, 1975-91.* Division of Subsistence, Alaska Department of Fish and Game. Technical Paper 220. Juneau.

Magdanz James, and Annie Olanna
1984 *Controls on Fishing Behavior on the Nome River.* Division of Subsistence, Alaska Department of Fish and Game. Technical Paper 207. Juneau.

1986 *Subsistence Land Use in Nome, a Northwest Alaska Regional Center.* Division of Subsistence, Alaska Department of Fish and Game. Technical Paper ___. Juneau.

Magdanz, James and Charles Utermohle
1994 *The Subsistence Salmon Fishery in the Norton Sound, Port Clarence, and Kotzebue Districts, 1994.* Division of Subsistence, Alaska Department of Fish and Game. Technical Paper 237.

Nome Subsistence Salmon Working Group
1999 *Recommendations to the Alaska Board of Fisheries for the management of the Nome Area Subsistence Salmon Fishery.* Alaska Board of Fisheries record copy 1, "Workgroup" tab. March 28, 1999. Juneau.

Pete, Mary
1996 Testimony before the Alaska Board of Fisheries, April 14, 1996. Director, Division of Subsistence, Alaska Department of Fish and Game. Juneau.

Petroff, Ivan
1884 Report on the population, industries, and resources of Alaska. IN *Tenth census of the United States.* Department of the Interior, Census Office. Washington D.C.

Raleigh, Robert F.
1957 *Western Alaska Salmon Investigations, Operation Report 1957: Reconnaissance of Salmon Fisheries Between Cape Newenham and Point Hope, Alaska, 1957.* Bureau of Commercial Fisheries, United States Fish and Wildlife Service.

Ray, Dorothy Jean
1964 Nineteenth Century Settlement and Subsistence Patterns in Bering Strait. *Arctic Anthropology* 2(2):61-94.

1967 Land Tenure and Polity of the Bering Strait Eskimos. *Journal of the West* 6(3):371-394.

References

1984 Bering Strait Eskimo. IN *Handbook of North American Indians: Arctic.* David Damas, vol. ed., William C. Sturtevant, gen. ed. Smithsonian Institution. Washington, D.C. pp. 285-302.

Thomas, Daniel

1980a *Nome Salmon Subsistence Research Report.* Division of Subsistence, Alaska Department of Fish and Game. Technical Paper 11. Juneau.

1980b *Issue Paper on the Nome River Subsistence Salmon Fishery.* Division of Subsistence, Alaska Department of Fish and Game. Technical Paper 10. Juneau.

University of Alaska

1994 *Cost of Food at Home for a Week in Alaska: December 1994*. Alaska Cooperative Extension. Fairbanks.

U.S. Census Bureau

2001 *Profiles of General Demographic Characteristics 2000, Alaska*. U.S. Department of Commerce. Washington, D.C.

Wolfe, Robert, and Linda Ellanna, compilers

1983 *Resource Use and Socioeconomic Systems: Case Studies of Fishing and Hunting in Alaska Communities*. Division of Subsistence, Alaska Department of Fish and Game. Technical Paper __. Juneau.

References